28th Congress, 2d Session. Doc. No. 66. Ho. of Reps. Treas. Dept.

LOUISVILLE AND PORTLAND CANAL COMPANY.

LETTER

FROM

THE SECRETARY OF THE TREASURY,

TRANSMITTING

A report relative to the purchase of individual stock in the Louisville and Portland Canal Company.

JANUARY 24, 1845.

Read, and referred to the Committee on Roads and Canals.

DEPARTMENT OF THE TREASURY,
January 21, 1845.

SIR: In compliance with the resolution of the House of Representatives of the 26th December last, I have the honor to communicate a report upon the subject of the proposed purchase of the shares of stock owned by individuals in the Louisville and Portland Canal Company.

Accept the renewed assurance of my profound respect.

GEO. M. BIBB,
Secretary of the Treasury.

Hon. JOHN W. JONES,
Speaker of the House of Representatives.

DEPARTMENT OF THE TREASURY,
January 21, 1845.

In compliance with the resolution of the House of Representatives of the 26th December last, respecting the propriety of the purchase, by the United States, of the residue of the stock held by individuals in "the Louisville and Portland Canal Company," with the view to making the navigation of the canal free from toll; and also as to the terms on which the purchase can be made, and the probable amount of money which will be required to effect the object, the Secretary of the Treasury has the honor to make the following report:

The great and increasing intercourse between the States above the falls of the Ohio river at Louisville, and the States and Territories below; the very great amount of tonnage which must pass over or around these falls,

Blair & Rives, print.

annually, in steamboats, keelboats, flatboats, and other water craft, in the descending and ascending navigation; the very great value of the goods, wares, and merchandise, of domestic and foreign origin, annually transported over and around the falls at Louisville, by water and by land; the natural obstruction between the upper and lower Ohio river, caused, during a great part of the year, by the falls and rapids of the river at Louisville, are considerations of national importance, and highly concerning the general welfare of the United States.

The navigation of the Ohio river (in connexion with artificial modes and means of transportation) is, in truth and fact, a connecting link in the great chain of commerce between the cities of New York, Philadelphia, and Baltimore, and other places east of the Allegany mountains, and the cities of Pittsburg, Wheeling, Cincinnati, Louisville, St. Louis, New Orleans, and numerous other places west and northwest of the Apalachian mountains. The navigation of the Ohio river has become, in the progress of internal improvements, one mode of connexion between the commercial enterprises upon the waters of the Atlantic ocean, the great northern lakes, the gulf of Mexico, and upon the numerous navigable streams in the great valley of the Mississippi.

An easy, safe, and free passage by water over or around the falls and rapids in the Ohio river at Jeffersonville, Clarkesville, and New Albany, on the Indiana side, and at Louisville and Portland on the Kentucky side, rises superior to local or sectional interests. It is of national importance; it concerns, in a high degree, the commercial interests of the United States and Territories, and of all nations having commercial intercourse with the United States.

The natural impediment to commerce, caused by the falls and rapids of the Ohio river at Louisville, called forth a charter, in the year 1825, from the General Assembly of the commonwealth of Kentucky to "the Louisville and Portland Canal Company," for the purpose of constructing a canal navigation, with suitable locks, docks, and basins, around the falls of the Ohio river, within the State of Kentucky. That charter was amended by the acts of the General Assembly of Kentucky: the one of the 21st February, in the year 1842; the other of the 22d February, in the year 1844.

The proceedings had and done under this charter, the benefits and defects of the existing canal, the costs thereof, the number of shares of stock owned by the United States, and the number of shares owned by individuals; the sum of tolls, the sum of the tonnage of vessels, which have passed through that canal since it was ready for the passage of flatboats, keelboats, barges, and steamboats, are detailed in document A, herewith communicated; being a report by the Hon. William Wilkins, Secretary of War, made to the Senate 20th of March, 1844, in compliance with a resolution of the Senate, and printed by the Senate's orders of the 21st March and 2d April, 1844.

The document B, herewith communicated, (being a report of the president of the Ohio and Portland Canal Company, made to the Secretary of the Treasury, bearing date January 8th, 1845,) shows the whole number of shares of stock to be 10,000: whereof 5,500 shares stand to the credit of the United States, and 4,500 are the property of 73 individuals, residing in several of the States; that these shares are of the value of $150 each, but that it is probable that the United States may purchase the shares owned by individuals at the price of $140 per share, considering the purpose of the

government to be, to make the canal free of any other tolls than such as are necessary for paying for improvements and charges of superintending the use, and for keeping the canal, &c., in repair.

The document A states the whole cost of the work to have amounted to $1,000,000; the propriety of enlarging the canal, and of other modes of facilitating the navigation around the falls, with the estimated expenses of the several modes. Document B shows the cost at which the United States may acquire the sole interest in the canal, at the price of $630,000.

The Secretary of the Treasury, being called by the resolution of the Senate of the 26th December, 1844, to express his "opinion as to the propriety of the purchase by the United States of the residue of the stock held by individual stockholders in the Louisville and Portland Canal Company, with the view to the making the navigation of said canal free from toll," does not hesitate to recommend the purchase and the purpose at $140 per share, amounting to $630,000.

In so doing, the Secretary of the Treasury does not confine his views to the sum of $630,000; but looks to a farther expenditure, as essential to the great object of overcoming the natural impediment, by an easy and convenient water-communication, free of the burdens and tolls upon commerce and navigation, which are felt as grievous, and much complained of, by the citizens of the United States.

The enterprise of constructing the present canal was hazardous, and required a great outlay before any returns were received. The interests acquired under the charter from Kentucky are to be respected, and justly to be compensated, before the United States should, by another improvement of the navigation around or over the falls, render valueless the property of individuals in the stock of this company. Preliminary to the action of the United States upon the subject of improving the navigation of the river at the falls aforementioned, the government should become the sole proprietor of the present canal and appurtenances. No just government can take or destroy the private property and interests of its citizens, lawfully and laudably acquired, without making due compensation. Argument in favor of that principle of justice and equity would be superfluous. It is sufficient to say that it is rendered sacred by the American constitutions, and by the enlightened sense of mankind.

The important interests of the United States require that the greatest convenience and freedom of navigation around or over the falls of the Ohio river, should be promoted by the government.

The law of Kentucky (whereof a copy is contained in document A) has provided for the contingency of the purchase of all the shares in the Louisville and Portland Canal Company to be made by the United States.

From a long residence at Louisville, and a critical examination of the present canal, the Secretary of the Treasury is of opinion that the essential interests of the public, whilst they have been greatly benefited by this canal, are far from being satisfied by it. It is too narrow and too shallow; it does not extend to the foot of the rapids; it mouths into the river in very strong water, in a narrow channel between the Kentucky shore and Sand island; which strong water, island, and narrowness of the channel, present inconveniences in low water to steamboats of the second class in taking the proper position for entering the canal in the ascending navigation. The narrowness of the canal, and want of depth of water, prevent boats of the first class from passing through.

The Secretary of the Treasury has read with attention the several proposed modes for improving the navigation contained in document A. He differs from Captain Cram, of the United States corps of topographical engineers, as to choosing any one of the routes so surveyed.

The present canal cannot be widened, and deepened, and extended to the proper point below the falls, without excluding the boats ascending and descending from the use of the canal during the time such improvement is in progress. Such obstruction for the long time which would be necessarily required to complete the improvement, would be too grievous; and that canal, when amended, would at best be imperfect and ineligible. The beginning of the line, and the end, are ill chosen. The great charges of the undertaking in 1825, and the limited means of the company, led to the choice of the cheapest and the less useful. That canal, imperfect as it is, ought to be open to use, whilst a more eligible and more satisfactory remedy for the natural impediment should be in the progress to completion.

For a canal, the Kentucky shore is the preferable; the wide, deep basin, at and below the mouth of Beargrass creek, affords the proper point for the beginning of a new canal, between the mouth of Beargrass and the beginning of the present canal. The terminus below, of a new canal, should be in the deep water, some distance below Portland. This line would be much shorter, and less obnoxious to other objections, than that on the Indiana side.

But it is worthy of examination and consideration, whether slack-water navigation over the falls, by means of dams and locks, as used on the river Appamattox, and on the Kentucky river, would not be the most competent and the cheapest mode of surmounting the rapids in the river Ohio at Louisville.

Whilst the proposed improvements may be under deliberation, the means of purchasing the shares of stock in the Louisville and Portland Canal Company may be in activity.

All which is most respectfully submitted for consideration.

GEO. M. BIBB,
Secretary of the Treasury.

A.

Report of the Secretary of War, communicating (in compliance with a resolution of the Senate,) a copy of the report of Captain T. J. Cram, on the best mode of improving the navigation of the Ohio river, at the falls at Louisville.

WAR DEPARTMENT, *March* 20, 1844.

SIR: In answer to the resolution of the Senate of the United States of the 21st of February, 1843, requiring the Secretary of War "to ascertain, and report to the next Congress, what is the best mode of improving the navigation of the Ohio river at the falls near Louisville, and the probable expense of such improvements," as well as in compliance with the further resolution of the Senate of the 14th ultimo, I respectfully transmit, herewith, a report of the colonel of the corps of topographical engineers;

which, it is believed, contains all the information required by the resolutions.

Very respectfully, your obedient servant,

WILLIAM WILKINS,
Secretary of War.

Hon. W. P. MANGUM,
President of the Senate.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, March 20, 1844.

SIR: I have the honor of transmitting, herewith, the report and estimate of Captain T. J. Cram, corps of topographical engineers, with accompanying drawings, in reference to the improvement of the navigation of the Ohio river at the falls near Louisville, called for by a resolution of the Senate of the 14th February, 1844. The survey, of which the report is now submitted, is the one directed to be made by a resolution of the Senate dated the 21st February, 1843.

Very respectfully, sir, your obedient servant,

J. J. ABERT,
Col. Corps Top. Engineers.

Hon. WILLIAM WILKINS,
Secretary of War.

OFFICE W. R. IMPROVEMENT,
Cincinnati, February 3, 1844.

SIR: I have the honor, herewith, to submit Captain Cram's report and drawings in reference to "the best method of improving the navigation of the Ohio at the falls near Louisville, and the probable cost thereof." The views presented in the report are so copious and diversified as to embrace every method of improvement having the slightest claim to consideration, together with the probable cost of carrying each method into effect. The conclusion to which the captain has arrived is drawn from a great variety of details, and seems well sustained by the facts in the case.

All subjects in relation to the improvement appear to have been so ably, clearly, and fully discussed by Captain Cram, that I feel called upon to do no more on this occasion than merely to signify my hearty concurrence with the views and opinions exhibited in the report.

I have the honor to be, sir, very respectfully, your obedient servant,

S. H. LONG,
Bt. Lieut. Col. Top. Eng.

Col. J. J. ABERT,
Chief Top. Engineer, Washington.

CINCINNATI, *February* 3, 1844.

SIR: In obedience to your orders of the 5th June last, requiring me to "execute a report, accompanied by drawings in plans and sections, in full

explanation," &c., relative to the survey, and with a view "to the best mode of improving the navigation of the Ohio at the falls near Louisville, Kentucky," &c., under a resolution of the Senate of the United States of February last; also, to "explain the connexion of the United States with the existing canal around said falls,"—I have the honor to submit the following report, with the accompanying drawings.

Very respectfully, your most obedient servant,

T. J. CRAM,
Captain U. S. corps Top. Eng.

Lieut. Colonel S. H. LONG,
Corps Top. Eng., Gen'l Sup't of western river improvements, Cincinnati, Ohio.

REPORT.

FEBRUARY 3, 1844.

The subjects of this report will be arranged in their appropriate places, under four distinct heads, to wit:

1st. Existing canal around the falls.
2d. Bed of the falls.
3d. Canal on the Indiana side.
4th. Comparison of projects.

EXISTING CANAL.

I.—*History of the construction of, and connexion of the United States with, the existing canal around the falls of the Ohio, on the Kentucky side.*

In 1825, the legislature of Kentucky granted a charter to the "Louisville and Portland Canal Company" to construct a "canal navigation, with suitable locks, docks, and basins, around the falls of the Ohio river, within the State of Kentucky;" making the capital stock to consist of $600,000, divided into shares of $100 each, and limiting the time of completing the canal to the 12th of January, 1828, but subsequently extended the time of completion to 6th February, 1831.

Again, the legislature passed an act 21st December, 1829, increasing the capital stock of the company by 1,000 shares, so as to make the whole stock amount to $700,000, and allowing the company to borrow money to complete the canal.

Under the foregoing acts, the canal was completed; so that the first boat passed through it on the 22d of December, 1830.

Owing to unforeseen and adverse circumstances, however, the company found itself embarrassed in its pecuniary affairs, and again sought relief in legislative aid. Accordingly, the legislature of Kentucky, having a just appreciation of the wants of the commerce on the Ohio, passed an act December 12, 1831, authorizing the company in these words: "To extend their capital stock to such an amount as will be sufficient to pay all the cost and expenses of constructing said canal, and the interest on the sums expended by the company in the construction, up to the time the said canal

was opened, and vessels passed through the same; and they may sell so many additional shares, at $100 each, as will pay said cost and interest."

Down to the time of the passage of this last act, the stockholders had received no returns in the shape of dividends or interest for the money which they had invested; it having been about three and one-third years since the principal portion of the stock was paid in.

Of the original stock, the United States subscribed for 1,000 shares about the 4th of June, 1825; afterwards, and under an act of Congress of March 2d, 1829, the United States subscribed for 1,335 shares, which had been forfeited by individual subscribers, from a want of confidence in the success of the enterprise.

Under the act of the legislature of Kentucky of December 12, 1831, the company made the following allowances to stockholders, to wit:

1st. Interest, amounting in the aggregate to 20 per cent., (not per annum, but per three and one-third years,) for stock which had been standing for three and one-third years; and 10 per cent., for that of one and two-thirds years standing; making the whole amount of interest $106,650, on all the stock that had been paid in; the United States receiving, on its 3,335 shares, the sum of $33,350.

2d. An allowance of $60,000 in the form of dividends, which it was thought had justly accrued in favor of the stockholders, and as a debt against the canal. Of this $60,000, the United States had credit to the amount of $23,350. The United States, therefore, received, for its portion of the interest and dividends, $56,700, or the equivalent thereof, in 567 additional shares of stock.

Hence, the whole amount of stock now owned by the United States is as follows:

	Shares.
Subscribed by the United States, between the 22d of January and 4th of June, 1825	1,000
Taken by the United States, under an act of Congress of March 2d, 1829, and which had been forfeited by individuals originally subscribing	1,335
Taken by the United States, and issued by the company, by virtue of the acts of the Kentucky legislature of December 21st, 1829, and December 12th, 1831	567
Making	2,902

for the total number of shares owned by the United States.

The whole amount of stock owned by individuals (prior to 1842) was 7,098 shares.

Thus it will be perceived the capital stock of the company consists of 10,000 shares. This stock was issued as follows:

	Shares.
Issued original subscription	6,000
Issued under act of Kentucky legislature, December, 1831	1,723
Issued for loans of 1836, under act of Kentucky legislature, December, 1831	1,560
Issued 1st January, 1836, under act of Kentucky legislature, December, 1831	150
Issued 13th April, 1837, under act of Kentucky legislature, December, 1831	100

Issued 1st Jauuary, 1838, under act of Kentucky legislature, December, 1831	50
Issued 1st January, 1839, under act of Kentucky legislature, December, 1831	200
Issued May, 1841, under act of Kentucky legislature, December, 1831	217
Total	10,000

The sums of money actually paid in by the United States, towards the construction of this canal, were—

On account of first subscription, about the 4th of June, 1825,	$100,000 00
On account of second subscription, about the 2d March, 1829,	133,500 00
	233,500 00

The money dividends actually paid out by the company to stockholders, (the United States inclusive,) from the 6th January, 1834, to 3d January, 1842, amount to $822,539.

Of these dividends, the United States treasury has received sums amounting, in all, to $257,778, as follows, to wit:

6th January, 1834—money dividend paid by the company to the United States	$14,010 00
7th July, 1834—money dividend paid by the company to the United States	8,706 00
5th January, 1835—money dividend paid by the company to the United States	8,706 00
3d July, 1835—money dividend paid by the company to the United States	11,608 00
4th January, 1836—money dividend paid by the company to the United States	11,608 00
15th July, 1836—money dividend paid by the company to the United States	11,608 00
2d January, 1837—money dividend paid by the company to the United States	11,608 00
3d July, 1837—money dividend paid by the company to the United States	17,412 00
1st January, 1838—money dividend paid by the company to the United States	20,314 00
2d July, 1838—money dividend paid by the company to the United States	17,412 00
7th January, 1839—money dividend paid by the company to the United States	14,510 00
1st July, 1839—money dividend paid by the company to the United States	26,118 00
6th January, 1840—money dividend paid by the company to the United States	23,216 00
6th July, 1840—money dividend paid by the company to the United States	14,510 00
4th January, 1841—money dividend paid by the company to the United States	20,314 00

5th July, 1841—money dividend paid by the company to the United States - - - - - -	$11,608 00
3d January, 1842—money dividend paid by the company to the United States - - - - -	14,510 00
	257,778 00

To this amount of moneys should be added the 567 shares of stock issued to the United States, as before stated; and we have what the United States treasury has received, in the shape of interest and dividends, from the canal company, in return for the moneys invested by the United States in this enterprise.

II. *Description and cost of the Louisville and Portland canal and dry dock.*

The location of the canal is shown on plat A, extending from Louisville to Shippingport; its length is about 10,800 feet. There are three lift-locks of about 8⅔ feet lift each, and 200 feet long and 50 feet wide in the clear of the chamber, and a guard-lock—all at the lower extremity of the canal.

The width of the canal is about 64 feet at the water-line in some places; and in others greater, by 1 to 4 feet. The bottom of the canal was found, by the survey of it, to be such as to give a depth in the present boat channel of nearly 3 feet in extreme low stage. If the present irregular bottom of the canal were equalized throughout its whole width and length, by excavating the high places, and filling the low places with the material thus obtained, so as to bring the whole on the same level throughout, the bottom thus equalized would be 2.97 feet below said extreme low stage.

The depth of cutting, in the construction of the canal, was from 25 to 30 feet; and about 8 feet of this depth was solid rock found in the bottom of the cut. The slopes of the canal are, for the most part, well paved with stone; and where the sides are vertical, the natural rock has been left, or a vertical wall of dry rubble constructed.

The details, in plan, profile, and section, of the different parts of the canal, are all to be found in the drawings attached to and forming a part of this report.

The cost of the work is made up as follows:

Interest on money borrowed to carry on the construction and allowances to stockholders - - - -	$152,827 37
Incidental account, including engineers and officers' salaries and office expenses - - - - -	21,881 25
Damages for right of way - - - - -	19,225 71
Real estate, consisting of two lots and two houses near the locks - - - - - - -	2,000 00
Loss on exchange of iron purchased and found unfit -	1,792 20
Excavation, embankment, locks, masonry, pavements, and expenses incidental thereto - - - -	802,273 47
Total cost of the work - - - - -	1,000,000 00

The average prices under which the work was completed, were: For ex-

cavation of rock, $1 50 per cubic yard; for paving the slopes, 1 foot thick, 15 cents per square yard; for excavating dirt, 15 cents per cubic yard; for lock and other masonry, $12 37 per perch of 25 cubic feet; the company being at the expense, besides, for a steam pump, and for working the same whenever necessary. The prices of provisions during the progress of the construction being about the same as at Louisville in 1843.

The final estimate of the engineer, of the amounts of the work done on the construction of the canal, was: Earth excavation, 655,249 cubic yards; rock excavation, 162,551 cubic yards; embankment, 133,203 cubic yards; masonry, 27,713 perches of 25 cubic feet; pavement, 113,635 square yards.

The total expenditures on the work, down to 31st December, 1842, including the original cost of construction and all subsequent improvements, which have been judiciously made from year to year, amount to - -	$1,019,277 09
Deduct "profit and loss" to the amount of - -	19,277 09
And we have balance of capital stock issued - -	1,000,000 00

Considering the numerous difficulties experienced by the company in the outset, and during the progress of their undertaking—and the want of confidence in the success of the work, evinced by the fact that almost all the subscribers living in its vicinity forfeited their stock after having paid instalments thereon—it may be said, on the whole, that the cost of the Louisville and Portland canal was reasonable. Indeed, it may well be doubted, with the same difficulties and distrust of stock subscribers, and notwithstanding the advantage of more recent experience in the general economy of a work, whether the same amount of work could be done on the same line of location with less money.

The following table (A) of facts is important, as showing, at a glance, the yearly receipts, expenditures, &c. Besides, it furnishes the data for several important calculations, which will be found in their appropriate places in this report.

Subsequently to the construction of the canal, a charter was obtained from the legislature of Kentucky, authorizing the construction of a dry-dock, but by a company legally distinct from the canal company. Accordingly, an excellent steamboat dock has been made alongside of the locks, as shown in drawing No. 7. The bottom of the dock is the natural rock; the sides are well constructed, and the work has proved not only profitable to the stockholders, but of great utility to the commerce of the Ohio. The original cost of the dock and the subsequent improvements has amounted to nearly $50,000.

The United States own none of the stock; but there is a clause in the charter giving the United States the refusal of the purchase of the dock upon a fair valuation, which is estimated in this report at $50,000.

The dock is under the same custody at present as the canal, and is a very useful appendage to the locks; and the cost of its management trifling, inasmuch as the working of it is done by the same hands that are employed on the canal.

TABLE A.

Expenditures and receipts on the Louisville and Portland canal, &c.

Year.	Expenses of repairs, alterations, labor, and tools.	Total amount of salaries of engineer, superintendent, treasurer, and collector, (all in one person,) with a deputy.	Cost of dredging.	Expenses of improvements for completing the canal.	Expenses of administration, including the salaries of president, secretary, directors, office expenses, taxes, &c.	Amount of tolls received.	Annual differences of amounts of tolls received.
1832*	$14,294 20	$1,000 00	–	$1,721 51	$2,070 94	$25,756 12	
1833	7,080 33	1,367 36	–	–	1,046 00	60,736 92	+$34,980 80
1834	7,266 87	1,618 48	–	11,067 45	1,088 53	61,848 17	+ 1,111 25
1835	5,593 29	2,000 00	$1,127 94	6,618 53	1,498 00	80,165 24	+ 18,317 07
1836	7,736 44	2,250 00	†10,708 57	10,320 37	2,207 28	88,343 23	+ 8,177 99
1837	11,790 70	2,250 00	3,314 85	5,942 05	1,765 80	145,424 69	+ 57,081 46
1838	12,179 08	2,250 00	2,687 46	20,846 30	1,734 55	121,107 16	— 24,317 53
1839	10,655 08	2,250 00	1,811 05	17,904 94	2,256 13	180,364 01	+ 59,256 85
1840	14,021 39	2,250 00	3,555 35	14,356 18	3,822 82	134,904 55	— 45,459 46
1841	7,203 22	3,000 00	4,176 46	‡5,832 10	2,310 00	113,944 59	— 20,959 96
1842	7,386 82	3,000 00	2,613 18	3,950 30	1,882 31	95,005 10	— 18,939 49
	105,207 42	23,235 84	29,994 86	98,559 73	21,682 36	1,107,599 78	69,248 98
	Divided by 11, gives	Divided by 11, gives	Divided by 8, gives	Divided by 11, gives	Divided by 11, gives	Divided by 11, gives	Divided by 10, gives
	9,564 31	2,112 35	3,749 35	8,959 97	1,971 12	100,690 89	6,924 90
	Deduct $500 being carried to dredging account.		Add $500 for annual repairs of dredge.				
	9,064 31 annual average.	2,112 35 annual average.	4,249 35 annual average.	8,959 97 annual average.	1,971 12 annual average.	100,690 89 annual average.	6,924 90 annual average.

* Prior to 1832, total of tolls received was $12,750 77, not included above.
Amount of tolls received (in table) - 1,107,599 78

Aggregate tolls received - 1,120,350 55 up to January 1, 1843.

† Of this sum, $8,128 26 was for a new dredging machine.
‡ Of this sum, $2,124 94 was for renewing the dredging machine.

NOTE.—Total receipts for 1843 (received too late for insertion in table) $107,274 65.

III.—*Proposed improvement of the Louisville and Portland canal.*

Drawing No. 1 exhibits the simultaneous relative elevations of the water in the canal at its head, and in the tail-bay of the lower lock. For example: the scale S, graduated into feet and quarters, erected vertically in the upper part of the canal, with its zero division at the bottom of the canal; the scale S, erected vertically, with its zero division at the bottom of

the tail-bay of the lower lock. Then, supposing the surface of the water in the bay to stand at 6 feet on this scale, (which is the case at extreme low-water stage,) the surface of the water in the upper part of the canal will stand at $3\frac{1}{4}$ feet, as shown by the scale S; and the total fall is then $25\frac{1}{4}$ feet, which is the amount of lockage in the canal at this stage of water. At extreme high water, the surface in the upper part of the canal marks 44 on the scale S, and the simultaneous elevation in the said tail-bay marks 70 on the scale S; and the total fall or lockage in the canal is then 2 feet. In like manner, and by a simple inspection of the drawing, will be found all simultaneous elevations, and the corresponding fall or lockage, at any stage intermediate between extreme high and extreme low water.

All improvements of the canal must be made, in so far as they have reference to the fall, to meet the circumstances exhibited by these scales, which have been constructed from observations of unquestionable authority, and extending through a period of years of equal duration with the existing canal.

Drawing No. 2 shows the longitudinal mean profile of the present bottom of the canal, averaged throughout its whole width and length. It is proposed to excavate the bottom, so as to give 5 feet depth of water in the canal, throughout its whole width, in extreme low-water stages. This will require an average depth of cutting, throughout the whole bottom, of $2\frac{1}{3}$ feet.

This work will be rather expensive, having to raise the excavated rock to so great a height, or to move it so great a distance as one half of the whole length of the canal, in order to get it out of the way. Again: the depth of the breast of the rock to work against will be inconveniently small.

Estimates.

Excavation and removal of 24,786 cubic yards of rock, and what will be equivalent to rock, to get 4 feet depth of water in the canal in times of lowest stage, at $1 50 - - -	$37,179 00
Every additional inch depth of cutting will cost $3,008; so that if we wish the cost of excavation to get 5 feet depth in the canal, in times of extreme low water, we have to augment the cost, answering to the depth of 4 feet, by the sum of - - - - - - - -	36,096 00
	73,275 00

It is to be hoped that some of this rock would come out in such shape as would make it useful for purposes of construction in other parts of the proposed improvements.

The upper portion of what is technically called the upper level of the canal, is represented on drawing No. 3.

At this upper entrance a strong current sets off over the falls of the river, in the direction shown in the drawing, so as to make it quite inconvenient for ingress or egress of boats.

It is proposed to remedy this inconvenience (not to say evil) by the construction of a floating boom of timbers, well trussed and sustained in the position B, by three thin though substantial piers of hydraulic masonry; and to attach

the extremity of the boom to the end of the canal wall, shown in the drawing, by a hinge of such construction as to allow the boom to rise and fall with the water, and in perfect obedience to the variable stages of the river.

When the canal is not in use, the boom may be easily swung into the position B; in that position, it will serve greatly to glance off drift wood, and send it over the falls, down the river. The present efficient superintendent of the canal has it in contemplation to construct a boom at the entrance, upon this plan; which may be regarded as his own idea, and which cannot but be highly commended.

Estimate.

Excavation of mud and work, for the foundations of the piers	$500 00
150 perches of hydraulic masonry, for three piers, for the boom to rest against, at $10 per perch - - - -	1,500 00
Boom of wooden frame, and truss work, fastenings, &c. -	3,000 00
	5,000 00

The piers would afford excellent stands for lights (which are much needed in dark nights) at the entrance of the canal; and it is believed they would not offer any serious impediment to the natural navigation up and down the falls, at those stages when the canal ceases to be used; nor is it presumed that so much drift wood or silt would lodge against them as to produce any serious inconvenience.

On this same drawing (No. 3) will also be observed other contemplated work for the improvement of the canal near its upper end. It is proposed to cut off the projecting angle A, and to shape the side of the canal at that place in the form of a curve, shown by the dotted line. This angle removed, a much more convenient ingress and egress will be insured; besides, room for a convenient harbor or recess for boats will be obtained at that place.

It is also proposed to erect a stone wall on that side of the canal where the top of the natural rock is shown, for an extent of about seven hundred feet, to a height of about ten feet above the rock; the inner face of the wall to be vertical.

Estimate.

Excavation of 908 cubic yards of rock, at $1 50 - -	$1,364 00
1,120 perches of wall, at $3 - - - -	3,360 00
This supposes a depth of 4 feet at lowest stage; if we have 5 feet, add - - - - - - -	165 00
	4,889 00

It is probable that some of the rock excavation from the angle A will answer for the construction of the wall.

Drawing No. 4 shows that, at present, parts of the canal have their sides contiguously with the water of jagged rock, projecting out from under the vertical wall which has been erected on that rock, so as to endanger the sides of boats as they pass along the canal.

This projecting rock is shown in the plan by the irregular line seen in the

drawing, and in profile, at R, in the cross section of the canal. The drawing of the cross section also exhibits the wall that has been well constructed by the company along the sides of the canal, and resting upon the natural rock. These walls are constructed in dry masonry, and of large stone, with their inner faces vertical, and with such care as to make the work of a permanent character.

Experience has shown that where the inner sides of the canal are vertical, instead of being of a slope next to the water, much less of river silt is deposited. The vertical sides are also better adapted to the shape of the boats than the sloping sides. Indeed, it has been clearly demonstrated, during the operations of the Louisville and Portland canal, that the rectangle is far preferable to the trapezoid for the cross section—for all that portion, at least, up as high as the centre of the wheel-houses. For these reasons, the rectangle has been adopted in all of the contemplated improvements.

The vertical walls represented in the cross section of the drawing constitute one of the principal improvements made in the canal since it was first opened, referred to in table A as "improvements for completing the canal."

Estimate.

Excavating 9,300 cubic yards of rock, now projecting into the canal, at $1 50 - - - - -	$13,950 00

Drawing No. 5 exhibits the lower portion of the existing canal, where its sides are of a continued slope quite down to the bottom, as one of the cross sections of the drawing represents. This is the trapezoidal shape referred to as having been shown by experience on this canal to be objectionable, and less adapted to the shape of boats, and affording more surface for the silt to settle upon, than if the inner sides were vertical.

The plan for the improvement requires this portion of the canal to be widened, by cutting out of the foot of the slope on both sides, so as to leave the sides next the water vertical; the bank that would be left being sustained by erecting vertical walls, as the other cross sections of the drawing show.

This method will effect a double object—the required width of water way for the canal will be obtained, and the requisite verticality of the sides maintained; and that, too, without any damage to the old embankment of the canal.

The excavation requisite for this part of the improvements will be, however, necessarily expensive, owing to the solidity of the old banks, the material of which they are composed, and the height to which the excavated material will have to be raised, or distance to be transported, in order to get it out of the way.

This excavation will not be of the natural rock, but will consist of the old loose rock and earth of which the embankment is formed in this portion of the canal.

Estimate.

4,037 cubic yards, to be excavated from the bottoms of the slopes, and removed, at 25 cents per cubic yard - -	$1,009 00
5,400 per ches of sustaining walls, at $3 - - -	16,320 00
	17,329 00

Drawing No. 6 represents the plan proposed for the construction of "passing places" for boats of such dimensions and so shaped as to allow them to pass each other while both are in motion, or while one may be at rest, at their own option.

Two of these recesses will be required to be constructed—one at a distance of about 4,200 feet above the present guard-lock of the canal, on the north side; and the other on the south side, about 7,200 feet above said lock.

These passing places will be expensive, having to remove a heavy embankment already constructed, in order to place them at the required points in the line of the canal.

The total width of the water way at the recesses, including the width of the canal proper, will be 128 feet in the clear; and from point to point, where they begin to fall back from the canal, the distance is 900 feet; leaving the widest part of the recess 300 feet long by 64 feet wide, as shown in the drawing. The sides of these bays are to be of a vertical wall, so that the cross section of the whole water-way, canal inclusive, shall be rectangular.

It is believed the curved sides represented in the plan are best adapted to an easy motion of the boat; also, to prevent a deposition of silt—there being no dead angles in the case.

Estimate.

Excavation of 46,154 cubic yards from old, and put into the new embankment, at 25 cents - - -	$11,538 00
Excavation of 10,757 cubic yards of rock, at $1 50 -	16,135 00
1,440 perches of walling, at $3 - - - -	4,320 00
1,260 perches of paving, at 75 cents - - -	945 00
This being for 4 feet—add, for 5 feet depth - -	2,132 00
This sum being for one recess - - - -	35,070 00

Drawing No. 7 represents, in detail, the existing group of locks of the canal; also, the Ohio river immediately at the foot of the lower lock; also, the part of the upper level of the canal immediately contiguous to the upper extremity of the group; also, the dry dock and buildings, and ground near the locks, and belonging to the company.

This drawing likewise exhibits the location and plans, in detail, of the proposed two new locks to be constructed alongside of the old ones. It is in contemplation to have the total lockage divided into two lifts of 12.62 feet each; the chambers of the locks to be 320 feet long, by 64 feet wide, in the clear; leaving the three old locks, which are about 200 feet by 50 feet chamber, and of 8.41 feet lift, for the accommodation of the smaller class of boats.

Estimate.

Excavation of 80,322 cubic yards of alluvium and clay, at 15 cents - - - - - - -	$12,048 00
Excavation of 31,360 cubic yards of rock, at $1 50 -	47,040 00
Masonry for locks, 11,866 perches, at $7 - - -	83,062 00
Gates, 4 pairs, including machinery, at $1,500 - -	6,000 00
	148,150 00

It will also be seen, on the same drawing, that it is proposed to excavate from the foot of the slope of the side of the canal, so as to get sufficient width of water at the upper extremity of the proposed new group of locks, and to sustain the portion of the old bank that will be left by a vertical wall.

This improvement will give an ample bay at the head of the locks, for manœuvring boats, and for entering the dry dock.

Estimate.

19,216 cubic yards of excavation out of the foot of the slope, at 25 cents per cubic yard - - - - -	$4,804 00
2,526 perches of sustaining wall, at $3 per perch - -	7,578 00
	12,382 00

Drawing No. 8 represents the longitudinal and transverse profiles of the natural ground where it is proposed to construct the new locks.

Should the foregoing contemplated improvements be made, the canal will be adapted to the most approved steamboat navigation that can be reasonably expected on the Ohio river.

The canal would have an uninterrupted width of water-way of 64 feet, at least; also, two intermediate passing places, with ample space for boats at the head of the canal, and immediately at the upper extremity of the double group of locks. The depth of water in the canal throughout would be 5 feet at times of extreme low water, and boats could pass through without detention, and without scraping their bottoms and sides.

The existing canal is about 64 feet wide; and experience has shown what philosophy proves—that, with this width, less sediment occurs in the canal, than if it were throughout sufficiently wide to allow two boats abreast.

The width of 64 feet, together with a sufficient number of passing places, are practically demonstrated as being a much better arrangement than a double width throughout the whole canal, without recesses. The agitation of the water by boats passing through, being greater upon a width of 64 feet than with the same number of boats upon a width of 128 feet, the earthy matter is held more in suspension, and of course more readily drawn off through the locks into the lower Ohio.

In the existing canal, the deposites occur chiefly near the upper entrance and in the lower locks; little in comparison is deposited in the intermediate portions of the canal.

The yearly expense of dredging out and removing the mud deposite, by a steam dredge kept for the purpose, forms a very considerable, and ever-to-be-continued item in the annual expenses of the canal.

For the last eight years, as shown by table A, this item has amounted to $4,249 annually, being nearly 25 per cent. of the whole average yearly expenses of the company.

It will be seen that the total of all the preceding sums, or estimate of the cost of all the improvements deemed necessary to adapt the existing canal around the falls to the wants of the present and future steamboat navigation of the river, (including an item for contingencies of $10,348,) amounts to $355,298.

Deduct from the whole number of shares what belongs to the United

States, and what will have been purchased of individuals (and intended to be conditionally transferred to the United States) up to the 1st of January, 1844, and include the dry dock, we shall have the following items to estimate for:

1st. Improvements to the amount of $355,298.

2d. 6,151 shares to be purchased of individuals.

3d. Dry dock.

If the stock could be purchased at $100 a share, we should find the amount of the estimate to be $1,020,398.

The dry dock is included, at nearly its original cost. This dock ought to go with the canal, should the purchase be made. The income of it might be made to defray, in part, the annual expenses of the custody of the canal.

IV.—*Expenses of maintaining the canal.*

By reference to table A, it appears that the expenses of the canal, excepting the item for improvements, have averaged $17,397 per year since it went into operation. This may be regarded as the necessary yearly expense of maintaining the work, and conducting all its operations. Should the canal be improved to the extent required, its operations would be enlarged, and its necessary yearly expenses for repairs, custody, &c., would probably amount to $25,000. To maintain the canal free, this sum would have to be raised from some source other than tolls.

If, however, tolls are to be charged to realize $25,000 annually, it is proper to know, in anticipation, the probable rate of the toll upon a given amount of freight passing through the canal. This is determined thus: The average number of tons freight passed annually through the canal has been 137,075. That part taken from the whole toll, to defray the necessary annual expenses of the work, has been at the rate of 12.69 cents per ton of freight; or, if estimated with reference to the tonnage of the boat carrying the freight, it will be found to have been at the rate of 9.52 cents upon each ton of the boat's measured tonnage.

Supposing the same average rate of trade to continue for a period of coming years, and the average business of the canal the same as heretofore, we shall find, in order to realize $25,000, the toll per ton of freight will be 18.34 cents, or 13.68 cents per ton of measured tonnage; so that a boat registered at 400 tons would pay $54 72, and one of 150 tons would pay $20 52, to pass through the canal. But as the boats are only a means for carrying on commerce, these charges would ultimately rest upon the producer and the consumer.

Again: should the average business of the canal for twelve coming years be greater by 50 per cent. than the average for the past twelve years, (as believed by many,) the tolls, to realize $25,000, will diminish in the ratio of 50 per cent., and be found to be about 12 cents upon a ton of freight, or 9 cents upon one ton of the boat's measured tonnage.

V.—*Additional pecuniary benefit consequent upon rendering the canal free.*

Although the canal has taken toll, the commerce of the west has annually realized a benefit of $180,788 as a direct consequence of the construction of this work, to say nothing of the saving from the item for pilotage over the falls; and should the present policy obtain, of allowing the canal

to continue its tolls, still this commerce would also continue to be annually benefited by the canal by the sum of $180,788. But, should the canal become free, an additional advantage would accrue to commerce; and the measure of this is now to be estimated thus: The annual sum, on an average, collected as tolls, has been $93,362. This, of course, would have been an additional annual saving to commerce, had the canal been maintained without charge to the trade. Therefore, the same rate of business continuing, there will be the sum of $93,362, as the measure of the additional saving that would be consequent upon rendering the canal free.

Let it be supposed, now, that tolls be charged only to realize annually the sum of $25,000 for maintaining an improved canal. This sum taken from $93,362, will leave $68,362 as the measure of that additional saving; and if we take into account an increase of business of only 23½ per cent., we shall find the measure of the additional saving to be $84,427 annually.

This saving in the next coming 15 years will amount to $1,266,405, which is near the cost of all the required improvements, of the stock yet to be purchased from individuals, and of the dry dock. If the business should increase by 50 per cent., the annual additional saving would amount to that sum in twelve and one-third years, commencing from the 1st of January, 1844.

BED OF THE FALLS.

Plat B, which accompanies this report, shows the bed of the river at the falls, and the extreme low water and usual low water channels. Of these, there are three principal ones, called "Kentucky chute," "Middle chute," and "Indian chute;" neither of which is navigable, however, by steamers, during the lowest stages of the river.

On the same sheet are also represented transverse and longitudinal profiles of the rock in various directions, giving an adequate idea of the natural rock bed of the river, extending all under these rapids.

VI.—*Action of the water at the falls of Ohio.*

The barrier of rock extending across, divides the Ohio into two parts, forming a deep pool immediately above, also a pool below the rapids.

When the river rises, both pools rise, but not equally; the lower one rises by a greater amount in a given time, than the rate of rise of the upper pool. A similar law is observable as the river subsides; that is, the lower one falls more in a given time than the upper pool.

These circumstances are of great importance in projecting works for the improvement of the navigation.

By a long series of accurate observations, the law of these relative rates of rise and fall has been obtained; and having tested the truth of what will be here briefly submitted on this point, in repeated instances, with the level, I have confidence in presenting the curve which I have constructed for the purpose of expressing this law of variable fall.

The curve is seen on drawing No. 9. To find the total fall, from the upper to the lower pool, (which are separated about 1¾ mile,) lay off on the axis O X the depth of water found in the upper part of the existing canal; erect the corresponding ordinate, and this, referred to the axis O Y, will give the number of feet and tenths of the total fall at the time.

For example: suppose we should find 10 feet depth of water in the upper part of the canal, or upon the crest of the rock at the head of the falls, (which rock is nearly at the same level as the bottom of that part of the canal;) lay off this on O X; it will, of course, extend from zero to 10; erect from 10 the vertical ordinate, which, being referred to O Y, will give 13.6 feet for the difference of level at that time of the surfaces of water in the upper and lower pools.

If we should find 3.4 feet water on the crest of the rock, the curve will give 25.45 feet as the total fall in the falls of the Ohio at this stage. If we find 6 feet depth on the crest, which is extreme high water, the corresponding ordinate of the curve gives 1.4 foot for the total fall from the head to the foot of the rapids, at that stage of water.

In like manner will the curve give the fall answering to any depth found on the crest of the natural rock at the head of the falls; the place at which these depths are to be measured being in the middle of the channel proper, which is in the "Indian chute," or in the upper part of the canal.

VII.—*Annual freshets.*

The annual freshets and stages of the Ohio are marked by well-defined periods, from a long series of observations, to wit: first, from 1st January to 1st July; second, from 1st July to 1st September; third, from 1st September to 1st January—in each year. The effects during these periods at the falls, and the corresponding stages of water in the upper and lower pools, are exhibited to the sight on drawing No. 10, and are there better explained than by any other method.

Boats can descend the falls, as a general rule, during the first period; the water in that period being of sufficient depth, and the total fall between the upper and lower pools sufficiently reduced to allow of the descent. During a small part of that period, boats can also ascend the falls in the "Middle chute."

By a careful inspection of the drawing, it will be seen that the second and third periods are those when the navigation is required to be provided for by artificial means.

In projecting plans for improving the natural bed, care should be taken not to interfere with or impair the natural facilities which the river affords to the navigation during the first period: for it will be seen that period embraces half of the year; and, although the winter season occurs in that time, still a considerable portion of it is a time of much business on the river.

VIII.—*Stages of water, and ability of boats to ascend the falls of the Ohio.*

Drawing No. 11 shows the longitudinal profile of the rock bed of the river, along the Middle chute, and at what stages of water boats can and cannot ascend that chute. It also shows the total fall between the pools to be 12½ feet, when those of the smallest draught can just ascend by the power of their own engines. The rate of ascent is then seen to be 6.473 feet vertical to one mile horizontal; and when the stage of water is such that the total fall is greater than 12½ feet, it is impossible for these boats to ascend that chute.

When the stage of water gives the difference of the level of the two pools 8.86 feet, or the ascent at the rate of 4.598 feet vertical to one mile horizontal, then all classes of boats can ascend with ease. No artificial constructions are therefore necessary to aid the navigation for higher stages of the river; nor should any works be made which shall interrupt the navigation the chute naturally affords at those high stages.

The limits above given, in reference to the ability of boats to ascend an inclined surface of water, result from facts obtained from observations, and which I have tested with such care, that I have the utmost confidence in adopting them as data in reference to improvements of these or any other river rapids navigated by steam.

Let us now pass to the Indiana side of the falls. Drawing No. 12 exhibits the longitudinal profile of the rock bed along the crooked channel called the "Indian chute." It also exhibits the result of an important experiment, which, together with what precedes upon this point, will give us all information needed for present practical purposes relative to the capacity of a boat to ascend an inclined surface of water.

It will be seen in the drawing, that on a time when the fall between the upper and lower pools was 13½ feet, or the ascent 5.1 feet vertical to one mile horizontal, the steamer "Uncle Sam" (owned by Paul Anderson, esq., and to whom I am indebted for valuable information on the subject,) barely ascended that channel. Her measured tonnage was 440, and she drew at the time 9.5 feet water, and was propelled by an engine of 250-horse power.

The steepest part of the ascent was 8.27 feet vertical to one mile horizontal. This ascent was but barely accomplished, and would never again be attempted knowingly.

From all the facts in reference to both chutes, it results that that stage of water giving the total fall between the upper and lower pools less than about 9 feet, is the highest stage to which artificial aid need extend; that between the limits of 13½ and 9 feet fall, artificial works may assist, but at the same time may be so indiscreetly made as to interfere with the natural navigation, good enough in itself; but between the limits of 13½ feet and 25¼ feet fall between the pools, artificial constructions may be made, so as to assist much in the navigation of the falls, descending and ascending.

IX.—*Silt and drift matter of the Ohio.*

In treating the subject of the Louisville and Portland canal, reference was made to a large annual expenditure for dredging mud which accumulates just below, and in the lower locks, and at the upper extremity of the canal. The lessons afforded by the circumstances of this case may be of signal benefit to the practical engineer engaged in works on the western rivers. In projecting improvements at the falls of the Ohio, the silt and drift wood must not be omitted; indeed, they offer the most serious obstacles to the successful working of all improvements the most skillful can possibly devise.

The enormous amount of alluvium at the foot of the falls—accumulated more abundantly there by the very cause which is found in the fact of the rise being more rapid in that neighborhood than above—evinces that, as the cause will remain, so will the effects continue.

Not only soft matter, but small stones, known to come even from the trib-

utaries of the upper Ohio, attached to floating ice, roots of trees, &c., on reaching the rocky barrier of the rapids, are detached, and then, by the force of the current, are carried over, and deposited in the vicinity of the foot of the rapids; and particularly are they found accumulated at the foot of the Kentucky chute in great quantity.

I have determined, by experiment in reference to the earthy matter held in suspension in times of high water, at the falls, the following results, to wit:

A given volume of muddy water is to the volume of the mud contained in it as 1 is to 0.01923. By separating the same volume of muddy water into clear water and mud, the resulting volume of clear water is to the resulting volume of mud as 1 is to 0.01961. The specific gravity of the muddy water, as it runs in times of high water, is 1.2745—that of the clear water obtained by the separation being 1, and the specific gravity of the earthy matter after separation is 1.5480.

Hence, in every 100 cubic feet of water passing the falls in times of high stages, there also passes, in the same time, suspended in that 100 cubic feet, very nearly 2 cubic feet of mud.

The area of the cross section of the stream taken on the crest of the rock at the head of the falls, is then 96.128 square feet, and the velocity of the stream may be proximately estimated at four miles the hour.

From these data, it is calculated that there passes over the falls, during every 24 hours, in the high stages of the river, 936,998,454 cubic feet of mud. This, uniformly spread over a section of land, (one square mile,) would cover it to a depth of 33.6 feet!

We need not, therefore, be surprised at the fact of ten feet depth of mud being found deposited in the locks of the existing canal during a single rise of the river. Sometimes the accumulation is so great, that serious detention occurs to boats passing through during the time when all the force that can be raised are dredging the mud to open the gates.

In times of high water, vast quantities of drift wood pass the falls. The channel which it takes in passing depends chiefly upon the direction of the wind. This drift wood is a very serious inconvenience to the existing canal; and it would be found one of the strongest difficulties to contend with, in keeping any work free from being choked at every rise of the river.

It is not difficult now to perceive that constructions might be made seemingly upon a perfect plan, and on a grand and extensive scale, in the bed of the falls, which in a very few years would be absolutely useless, from the accumulation of silt and the effects of drifting matter. They might not only not afford any improvement to the navigation, but they might seriously injure the natural navigation which now exists for some portion of the time.

X.—*Proposed improvements.*

There are four methods by which the bed of the falls of the Ohio may be improved. They, with their probable cost, will now be given in order.

First method. To blast out the rocky places now in the way of the navigation of the Indian chute at extreme low water. All these places are numbered from 1 to 7, inclusive, and represented on drawing No. 13. Rocky place No. 7, is very dangerous at a certain stage, and should be improved, at all events, to the cost of $7,600.

This method of improving Indian chute may be denominated the method of the falls pilots, whose business it is to pilot boats down the falls for a consideration, which comes ultimately out of the producer and consumer. These pilots are appointed under the laws of Kentucky and Indiana, and find lucrative employment in times of dangerous stages of water at the falls.

Should the plan of the pilots be executed agreeably to the recommendation of the Committee on Roads and Canals in the United States Senate in 1840, it would unquestionably afford some ease to the navigation. Less difficulty would be experienced in piloting a boat down the falls at particular stages. But if the rocky places were blasted to attain sufficient width of channel, it would only be of use to a descending navigation; for the rate of ascent in low water (the very time when most needed) would be 15.5 feet vertical in the steepest place, and on an average throughout 9.444 feet vertical to one mile horizontal; which exceeds the limits we have practically demonstrated for the ability of boats to ascend. (See drawing No. 12.)

Again: the mean depth of water, in low stages, at the head of the falls, on the crest of the rock, is but $3\frac{1}{3}$ feet; and were the plan executed as recommended by that honorable committee, with the condition (to use their own language) "that the channel is not to be blown out of the rock, which forms the dam across the river at the head of the falls," &c., still the descending navigation would be of no use whatever, at that stage, for boats drawing over $3\frac{1}{3}$ feet; because of the impossibility of their getting over the crest of the rock. That committee seems to have given much weight to the opinions of the pilots, in the absence of accurate surveys and minute measurements, which are the only sure data for any plan of improvement. The truth is, as shown by actual surveys, what was supposed by pilots would cost $15,000, and estimated by the committee to cost $150,000, would cost $64,405.

Were this sum expended in blasting out the rock, as literally recommended in the report of the committee, it would be not so much in aid of commerce, as it would be in aid of the falls pilots. Commerce would be very little, if at all, benefited by it; for, although the pilotage per boat might be a little less, insurance would be no less—the descent continuing as steep, and, on that account, as dangerous as before; and as the time would be increased for the services of the pilots, so would the total amount they receive from the boats be augmented.

To give this plan of the pilots safety, it would be necessary to add what may be termed a "supplement" to it; which would consist in cutting a channel through the crest of the rock, 100 feet wide at least, represented in position by A B, on drawing No. 13; and erect canal walls on each side, with a double set of steamboat locks at A, of one lift of 12 feet; and thus overcome the steepest and most dangerous part of the descent. The remainder of the descent to the bottom of the falls would be 6.5 feet vertical to one mile horizontal; and might be safely descended by the aid of skillful pilots, notwithstanding the extreme crookedness of that chute. But it has been before shown, that this 6.5 feet vertical to one mile horizontal could not be ascended in the present state of the ability of steamboats. Therefore, this plan of the pilots, even if carried out to the full extent of its merits, by the addition of the supplement, would afford no aid to the ascending navigation, until the improvements in boats shall be made so as to

enable them to ascend an inclined surface of water, by the power of their own engines, of 6.5 feet vertical to one mile horizontal.

The supplement provides for a depth of water, at extreme low stage, in the artificial channel through the rock at the head of the falls, of 5 feet; this being the minimum depth admissible for an improved steamboat navigation at these falls. It will also be seen that by the lift lock at A, the idea of not drawing off the water from the upper pool, so strongly insisted on by the committee of the Senate, in their report, is maintained—the effect of the supplemental improvement upon the level of the water in that pool being the same as if the present rock were left in its natural state, to all practical purposes; since the quantity drawn off in passing one boat, or the whole number that could be passed in a day, would be insensible, compared with the immense volume of water in that pool.

Estimate.

Excavating and removing rock at site			No. 1, 200 cubic yds., at $5 -	$1,000
Do	do	do	No. 2, 20 cubic yds., at $5 -	100
Do	do	do	No. 3, 50 cubic yds., at $7 -	350
Do	do	do	No. 4, 12,500 cubic yds., at $5	62,500
Do	do	do	No. 5, 10 cubic yds., at $7 -	70
Do	do	do	No. 6, 55 cubic yds., at $7 -	385
Do	do	do	No. 7, 3,800 cubic yds., at $2	7,600
				72,005

Supplement.

Excavation of 27,650 cubic yards of rock from under water, (difficult to accomplish,) at $5 - - - - -	138,250
2 locks (side by side) at A, 12 feet lift—or total lockage—each 320 feet by 64 feet in the clear of the chamber, gates and fixtures	125,000
Suspension bridge between locks and shore - - -	15,000
Masonry for side walls of channel, 6 feet high, and 5 feet thick, 10,740 perches, at $15 - - - - -	161,100
	511,355
Superintendency and contingencies, 3 per centum - -	15,340
	526,695

The probable cost of the first method of improvement is entirely too much in proportion to the benefit to be derived. The expense of maintaining a work only adapted to a descending navigation—and that but an indifferent one, requiring pilotage too—would be nearly as much as for an improvement that would answer a whole instead of a half purpose.

Suppose this plan, however, to be executed, (at an expense of $526,695,) and found to answer a good purpose for a descending navigation; how long would it be before the commercial interest would demand a free improvement for an ascending navigation? And thus, in the ultimate, the total cost of this first method would be thrown aside, inasmuch as it could not be made a part of an improvement best calculated to subserve both the ascending and descending navigation. This first method, therefore, ought to be rejected.

Effect of the rock barrier at the falls upon the permanency of the navigation between Louisville and Cincinnati.—It will be seen that the improvements do not contemplate drawing the upper pool to a lower level than that already provided by nature.

Sheet C exhibits the details of profiles of the rocky barrier; also, a longitudinal connected profile, embracing the rocky bed, from the lower to the upper pool, with the bed at Six Mile Island bar, Twelve Mile Island bar, and Grassy Flat bar, together with the cross sections of the Ohio at these bars; all of which are represented on sheets C', C'', C'''.

At extreme low stage, the water on these shoals, in the deepest part of the track of navigation, is as follows, to wit:

Rock dam at the head of the falls	3.33	feet deep.
Six Mile Island bar, 6 miles above the falls	9.30	"
Twelve Mile Island bar, 12 miles above the falls	3.80	"
Grassy Flat bar, about 18 miles above the falls	2.80	"

The barrier at the falls has an effect to hold a certain portion of the water, for miles above, in equilibrio. The water, however, contained in the basin between the falls and Grassy flats will only be considered in the discussion.

The running prism of water superposed and moving on the portion in equilibrio, disregarding evaporation, is that which is discharged over the crest of the rock at the head of the falls, where, at extreme low stage, the area of the cross section of the running prism is 4,601 square feet, and the mean depth of the section 1.996 foot. The area of the cross section of the same prism at Grassy flat is 9,760 square feet, and the mean depth of the section 3.911 feet.

During a stage of extreme low water, suppose the running prism to be (as it will be) in a state of "permanent motion," as defined by Bellenger; and suppose the quantities discharged in the same time through the two sections equal, abstracting evaporation, the velocity at the Grassy flat section will be $\frac{4701}{10000}$ of the velocity at the falls section.

Now, let us suppose the rock cut away at the falls, so as to increase the cross section of the running prism there by 167 square feet—which is the amount it would be increased, provided we leave out the locks in the supplement to the pilots' method of improvement, and thus have an open canal of 100 feet wide.

By a simple calculation from the foregoing data, obtained from the surveys, and expressed on sheet C, we find that, in order to restore the permanent motion of the prism, we should be under the necessity of increasing the cross section of the prism at Grassy flat, so it should be 10,123 square feet, or greater by 363 square feet, at extreme low water, than at present. The steamboat channel there is now only 2.8 feet deep at that stage, in the deepest part of the tract. To secure a width of 200 feet, so as to make that section greater than at present by 363 square feet, we should have to excavate that bar so as to leave the bottom of the new channel 1.81 foot lower than the bottom of the existing channel.

Upon the same principle, if Grassy Flat bar be dug away, it might become necessary to dig away the top of another bar further up the river, to restore the permanent motion of another prism, and so on.

From these results it will be seen, that a removal of the rock barrier of the Ohio, extending across the river, analogous to a dam, separating the stream into two parts, or even cutting a channel and leaving it open, cannot

be done without great risk of injuring the navigation between Louisville and Cincinnati at certain places, where, in low stages, there is now barely depth enough to allow of 2.8 feet draught.

At lowest stages of water, one inch more or less depth on Grassy Flat bar is considered of consequence by those engaged in the navigation.

No construction should be made at the falls, which may tend to diminish the depth on that bar.

The second method of improving the bed of the falls consists in constructing a canal, extending in a direct line from the head of "Middle chute" to the foot of the "Kentucky chute," as shown on drawing No. 13, and marked C D; the natural rock to be blasted off in places where required, to form a sufficiently smooth bed, with a declivity in the direction of the axis of the canal of $\frac{1}{10000}$, (see drawing No. 14;) the side walls of the canal to be built to a height of 2.44 feet above that stage of water when the canal would cease to be used—the total fall in the rapids then being so much reduced that boats would ascend by the power of their own engines; the inside faces of the canal walls to have a slight batter, and the outside to have a greater batter. Drawing No. 14 shows all the details of this second method in a clearer manner than can be expressed in words.

The extent from the upper extremity of the canal to the foot of the locks would be nearly two miles; the width of the canal at the water-line of low water, 64 feet; the water to be 5 feet deep in the upper end of the canal, and 6 feet on the mitre sill of the upper lock, in times of extreme low-water stages.

The locks to be double, and divided into two lifts of 12½ feet each; their chambers to be 320 by 64 feet in the clear; and to have a commodious head bay for the manœuvring of boats, without damage, while in the act of egress or ingress; and the canal to have one passing place for boats, and that located at its middle point, as the drawing shows, and of the same form as those projected for the Louisville and Portland canal, and of course possessed of similar facilities.

Estimate.

Excavation for lock-pits, 41,292 cubic yards of rock, at $1 50	$61,938 00
Masonry for locks, 23,000 perches, at $8 - - -	184,000 00
Lock-gates and machinery for eight pairs, at $1,400 -	11,200 00
Excavation of rock for bed of canal, 53,977 cubic yards, at $1	53,977 00
Coffer-dams for this excavation - - - -	10,000 00
Masonry for side walls of canal, 95,200 perches, at $8 -	761,600 00
Masonry for side walls of canal, 21,969 perches, with iron clamps and dowels, at $10 - - - -	219,690 00
Guard gates and piers at head of canal - - -	5,000 00
Iron suspension foot-bridge between the locks and the shore	5,000 00
	1,312,405 00
Superintendency and contingencies, 3 per cent. - -	39,372 00
	1,351,777 00

The advantages of the site are, that the natural rock is of such form all the way, as to give, comparatively, the least rock excavation, as shown in

elevation on the drawing. There is no earth to be excavated, nature having done that part of the work. The line or axis of the work is nearly parallel with the mean current of the stream at high stages. All the lockage is brought to one place, at the lower extremity of the canal, and of tolerably easy access from the shore.

The objections seem to be, that the silt mentioned in treating upon that subject would accumulate in the immediate vicinity of the foot of the locks, and require a heavy annual expense for dredging; also, would the difficulty of entering the upper extremity of the canal be a serious objection, and there are times when the canal would be filled with drift wood. These objections are common to every work that can be projected for the improvement of the bed of the falls, but it may be said to apply with as little force to this method as to any other. It would require an additional sum of $250,000 to the estimate, to obviate all the objections to this method.

In times of extreme high water, the canal would be submerged, and during a subsidence of the water, logs, brush, &c. would lodge on the walls. So might it be with any work at the falls. In 1832 the water rose to a height of forty-four feet, in the upper pool, above the top of the rock forming the bed at the head of the falls. This is the stage which has been called extreme high water in this report. But who can assign limits to the rise of the Ohio? and what work, within any reasonable degree of cost, could be made to shut out the water in its highest possible stages?

The third method (drawing No. 15) consists in excavating a canal (E F) 128 feet wide and 7,458 feet long, and locking from its extremity E, down into the head of the "big eddy," seen in the drawing; then to cut the sluice S, of 128 feet width and 4,413 feet long, from the head of that eddy, entirely through Goose island, and across a point of Rock island, into the pool below the rapids. The inclination of the bottom of the sluice to be 4.5 feet vertical to one mile horizontal, which we have shown to be of easy ascent for boats of all classes. It is believed the width assigned for the sluice would afford spread enough for the water to allow a boat to ascend that inclination.

All the lockage of the canal would be at its lower extremity, the "big eddy" forming the tail bay of the group of locks. There should be two double locks, the two lifts to be 9 feet each, and the chambers 320 by 64 feet in the clear. The walls of the canal to be very little, if any, above the surface of low water, but firmly fixed to the rock below.

The plans, elevations, sections, and details of this method are all to be seen on drawing No. 15.

Estimate.

Excavation for lock pits and construction of locks - -	$166,080 00
Excavation of rock for bed of canal, 98,050 cubic yards, at $3 - - - - - - - -	294,150 00
Masonry for side walls of canal, 11,932 perches, at $13 -	155,116 00
Excavation of rock for sluice, 241,053 cubic yards, at $1 50	361,579 00
	976,925 00
Superintendency and contingencies, 3 per cent. - -	29,308 00
	1,006,233 00

It will be seen, from the elevation, that, with the exception of the locks and the lower part of the canal, the work would be submerged, excepting at extreme low water. The water is very deep at E, and it is believed the force of the natural channel would sweep along all the silt that would pass through the locks, and we should thus avoid an annual expense for dredging. The drift wood would float over the work in times of high water without injury; for then the canal, locks, and sluice, would be totally submerged to a depth of from 10 to 20 feet. The width of the canal and sluice would allow two boats to pass each other at any place—the walls of the canal being only as high as the surface of the low water, that volume of water displaced by the boat would be easily displaced over them, and the swell or wave in front of the boats would be of little effect to retard their motion. But it would not be safe for one boat to ascend the sluice while another should be descending. This would cause serious detention at the head and foot of the sluice. Again: the entrance at the upper end of the canal would be at an inconvenient distance from the shore, and difficult to enter. Neither would the locks be of easy access from the main shore, and there would be times when it would be impossible to open the gates at the very time when they would be most needed. The suspension bridge, which would have to be erected for communication, would be liable to be swept off by drift wood.

No serious inconvenience would be experienced in this mode of improvement, from a deposition of silt; and, on this account, it is perhaps the best plan that can be devised for improving the bed of the falls, but great inconvenience would arise from drift wood.

The fourth method consists in the sluice S, (which has been described as a part of the third method,) and a dam G H, with locks, instead of the canal E F, as shown on drawing No. 15.

The plans, elevations, sections, and details of the dam, are all clearly represented on drawing No. 16.

The dam to be just high enough to raise the water above it, so that it should be 5 feet deep at extreme low water on the crest of the natural rock at the head of the falls, which, at that stage, would make the water deeper by about 1.67 foot than in the natural condition of the falls. The total lockage would be 21 feet. There should be two double locks, of 10½ feet lift; they would be of the same horizontal dimensions, and nearly in the same place, as those recommended in the third method—*i. e.* 320 feet by 64 in the chamber, and located at the head of the "big eddy."

Estimate.

Sluice, as before, through Goose island - - -	$361,579 00
Crib foundation in deep channel, 10,400 perches, at $4 -	41,600 00
Masonry for dam, 4,420 perches, at $10 - - -	44,200 00
Stone backing for dam, 3,221 perches, at $1 50 - -	4,832 00
Locks, (double set,) 10½ feet lift each - - -	193,194 00
	645,405 00
Superintendency and contingencies, 3 per cent. - -	19,362 00
	664,767 00

This method of improvement is, at first view, the most tempting of all. The comparatively small estimate of its probable cost, and the numerous examples of successful improvement, *thus far*, by locks and dams upon the Kentucky and Green rivers, are recommendations in favor of this method of improving the falls of the Ohio. But the full merits or defects of those improvements have not yet had time for development.

The objections to the sluice S have already been stated, as well as its advantages for keeping itself clear of all deposites, and need not be repeated. The objections to the dam are strong: 1st. Although ever so strongly built, it would be liable to injury from ice and drift wood. 2d. It would be an obstacle to the natural navigation of the falls, in the first and third periods mentioned in another part of the report, and at times in those periods when the locks could not be used conveniently, being entirely submerged; then there would be a liability of all navigation being stopped for a time. 3d. It being transversely across the stream, would check the suspended silt and drift matter that has been shown to pass over the falls in such immense quantities, so that in a few years the harbor of Louisville would probably be seriously injured, if not entirely filled with a deposite of mud, intermixed with brush, logs, trees, &c. In like manner might we expect the landing at Jeffersonville, on the Indiana side, would be seriously injured. 4th. The locks would not be of any easier access than those of the other methods.

From the analysis of the defects of all the methods of improving the natural bed, I am forced to the opinion that any work coming within any reasonable cost would be found almost useless in a few years, from injuries, deposites of mud, and being choked with drift wood; or else such an immense expense would have to be incurred at every rise of water, to clear the works from these evils, that the tolls would bear heavily upon the trade. Again: the custody and repairs of a work in the bed of the river would be vastly more expensive than if constructed around the falls; and there would be times when boats would be detained for days, before the gates could be opened to allow of the passage.

The risk to contractors in the process of constructing the work would be immense. It would be impossible to calculate this risk beforehand; and it is this risk that might cause the calculations which I have made of the cost of these works to fall far short of the reality in practice, notwithstanding the utmost pains have been taken to arrive at fair estimates.

CANAL ON THE INDIANA SIDE.

XI.—*To be fed from the Ohio.*

There are two routes on which a steamboat canal can be well constructed around the falls on the Indiana side, and fed from the Ohio.

Minute surveys have been made longitudinally and transversely on both, with all the care the importance of the subject demanded.

The approximate locations and the profiles of both routes are represented on plat D, in all desirable minutiæ.

Route No. 1 commences just above the town of Jeffersonville, Indiana, and, passing through the outskirts of the village, enters the small valley occupied by Cane run: after following that valley for some distance, it passes out, and thence across a table land, and enters the Ohio at the foot of the

falls, between the Point of Rocks and the mouth of Mill run, as seen on the drawing.

The whole extent of the route is 146 feet less than three miles. The greatest depth of cutting is 59.2 feet; and (including the immediate banks of the river) the least depth of cutting is 19 feet. In the lower stratum, throughout the whole extent, there is solid limestone rock, in which the average depth of cutting would be about 10 feet.

It is proposed to have the grade of the bottom on route No. 1 so as to give five feet depth of water in the upper, and 5.5 feet in the lower extremity of the canal, at extreme low stage. The width of the canal, in the clear, is to be 64 feet on the water line—the sides rising vertically from the bottom to the top of the natural rock; then to rise by a wall with a slight batter on the inner face, to the height of 15 feet above that rock; after that, the cut is to have a slope of 1½ horizontal to 1 vertical, and the faces of the slopes paved with stone. The walls and pavement to be made of the rock from the cut.

It is intended to have double locks, and the total lockage, which will be at the lower extremity, will be divided into two lifts of 12 feet each. The chambers of the locks to be 320 feet by 64 feet in the clear. Also, a guard lock and a boom for safety of entrance, at the upper extremity.

At the head of the locks there is to be a large bay 500 feet in length, and 160 feet in width. There are also to be three passing places for boats, of the same plan as those proposed for the Louisville and Portland canal, distributed at proper distances throughout the line.

The details of the canal, locks, bay, and passing places, are all expressed in plan, elevation, and section, on drawing No. 17, and cannot fail to give every particular; it being remarked that, for the plan of the passing places, reference must be made to drawing No. 6, under the head of "existing canal."

Estimate.

Excavation of earth, 2,040,870 cubic yards, and put into embankment where needed, at 20 cents - -	$408,174 00
Excavation of rock, 292,448 cubic yards, and putting where needed, at $1 50 - - - -	438,672 00
Dry masonry, rock from the cut, for sustaining walls, 97,169 perches, at $1 - - - - -	97,169 00
Pavement of faces of slopes, 49,157 perches, at 75 cents -	36,868 00
Construction of three passing places, at $33,000 - -	99,000 00
Right of soil, 150 acres, at $50 per acre - - -	7,500 00
Clearing and grubbing 50 acres, at $40 per acre; fencing 2,000 running rods, at $1 50 - - -	5,000 00
Boom and piers at upper extremity of canal, and guard gates, $10,000; waste weirs, $13,000 - - -	23,000 00
Excavation of 18,921 cubic yards rock, for lock pits, at $1 50 - - - - - -	28,381 00
Masonry for locks, 23,020 perches, at $7 - -	161,140 00
Lock gates, 8 pairs, including machinery, at $1,400 -	11,200 00
Excavation of 25,160 cubic yards of rock for bay, at head of locks, at $1 25 - - - - -	31,450 00
Excavation of 112,748 cubic yards of alluvium, for bay, at 10 cents - - - - - -	11,275 00

Sustaining walls for bay, 888 perches, at $3 - -		$2,664 00
Pavement for bay, 3,636 perches, at 75 cents - -		2,727 00
	1,364,220	00
Superintendency and contingencies, 3 per cent. - -	40,926	00
	1,405,146	00

This is the shortest and least expensive route upon which a steamboat canal, adapted to the wants of commerce, can be constructed upon a durable plan around the falls, and upon the Indiana side of the Ohio.

The only objection of any moment that can be urged against the route is the certainty of a large deposite being made on every rise of the river at the upper extremity of the canal, and in the immediate vicinity of the foot of the lower locks. The annual expenditure for dredging, judging from experience of the Louisville and Portland canal, and a knowledge of the circumstances of the silt, would not be less than $7,000. The accumulation of silt, in a few years, in the tail bay of the lower lock, and in its immediate vicinity, would make the ingress and egress there very inconvenient.

There are two serious obstructions to the navigation of the river, which a canal on route No. 1, or the Louisville and Portland canal, cannot ameliorate, to wit: the rock in the way of the channel near Sand island, called No. 7 in treating of the bed of the river; and a sand shoal at the foot of that island, called Albany bar. (See plate A.)

To avoid these obstructions, and to obtain an entrance where the locks would not be liable to be buried in mud at every flood, another route was surveyed, which will now be considered under the designation of

Route No. 2.—This route commences exactly with No. 1, and is common with it, as shown on sheet D, for an extent of about 2.4 miles; thence diverging, it enters the valley of Mill run, following along and parallel with it for some extent; then, crossing a summit, it reaches Silver creek. After passing this stream, the line crosses another summit, and reaches Falling run; and, entering the valley of that run, it follows the same to the Ohio, and enters the river at a bold rocky place, where excellent ingress and egress can always be had, without fear of an accumulation of silt.

The total length of the route No. 2 is very nearly $7\frac{1}{5}$ miles. The greatest depth of cutting on this route would be 65.5 feet, between Silver creek and Falling run. The maximum depth between Jeffersonville and Mill run, as before stated, would be 59.2 feet. The depth of solid rock-cutting, in the lower stratum, averaged throughout the line, would be about $9\frac{1}{2}$ feet.

The same cross section has been adopted for the canal on this route, as explained for route No. 1, as well as the same number of double locks, and the same dimensions for the chambers. The total lockage to be divided into two lifts, of $14\frac{1}{2}$ feet each, at extreme low water; the upper extremity of the canal to have 5 feet depth of water, and the lower extremity 6.5 feet depth, which gives the grade of the bottom of the canal a descent of $1\frac{1}{2}$ foot in about 7 miles. Five passing places for boats would be necessary in this line.

The details of the locks, in elevation and cross section of bay, are expressed on drawing No. 18—reference being made, for the plan of the locks and plan of the bay, to drawing No. 17.

The probable cost of the canal proposed for route No. 2 would be as found in the following estimate:

Excavation of 3,712,795 cubic yards earth, and put in embankment, at 20 cents	$742,559
Excavation of 831,902 cubic yards rock, at $1 50	1,247,853
Sustaining wall of dry masonry, 240,868 perches, (rock from cut,) at $1	240,868
Pavement for slopes, 64,865 perches, at 75 cents	48,649
Construction of 5 passing places for boats, at $33,000	165,000
Right of soil, 377 acres, at $50: clearing and grubbing 125 acres, at $40; fencing 5,022 rods, at $1	28,872
Boom, piers, guard, and flood gates, at upper extremity of canal	10,000
Waste weirs at Cane run, Mill creek, Silver creek, Springer's gut, and Falling run, culverts, and bridges	50,000
Excavation, 91,728 cubic yards rock, for lock pits, at $1 50	137,592
Masonry for locks, 28,134 perches, at $7	196,938
Lock gates, 8 pairs, at $1,680, machinery inclusive	13,440
Excavation, 11,222 cubic yards rock, and put into embankment for bay at head of locks, at $1 25	14,027
Embankment for bay, 67,133 cubic yards, (borrowed,) at 20 cents	13,427
Pavement for slopes of bay, 1,616 perches, at 75 cents	1,212
Sustaining wall for slopes of bay, 1,616 perches, at $3	4,848
	2,915,335
Superintendency and contingencies, at 2 per cent.	58,307
	2,973,642

The advantages of this route have been stated as consisting in avoiding the "Albany bar," "rock No. 7," and securing a position for the locks, where ingress and egress would be comparatively free from accumulating silt. The objection to this route is the great expense—being, it is true, at the rate of $55,374 less per mile; still, on the whole, greater in the ratio of 2.1 to 1 than for a canal on route No. 1.

Again: the liability of silt accumulating in a work on route No. 2, from the various creeks and runs which would necessarily have to be let in, so that they might cross the canal; the crookedness at Falling run, and tendency, on this account, to prevent the silt from running freely through the length of the line—making the time of passing through it more than double that for route No. 1, or the existing canal—are all so many objections of no small force.

XII.—*Canal on a high level, around the falls, to be fed from other sources than the Ohio.*

From the report of the board of internal improvements of Indiana, in 1835, and other sources of information, an opinion has obtained that, to avoid the great expense of cutting for a canal around the falls, to be fed from the upper pool, a canal, with very little cutting, might be made on a high level, locking from both its extremities into the Ohio, and feeding it from the interior of Indiana; that, by such a project, a steamboat canal could be had around the falls, and at the same time a navigable feeder into a very fertile district of that State.

Having obtained, from official documents and maps pertaining to the surveys for improvements in Indiana, the level notes of two lines in the expanse of territory which must embrace the route of the contemplated feeder, the degree of feasibility of this project has been investigated, and the details of it are developed in drawings on sheet E.

The same location and dimension of works have been adopted for the canal on a high level, as for that of route No. 1—the total length being little short of three miles. The total lockage at the upper extremity to be divided into 3 lifts of 11⅓ feet each, and that of the lower extremity into 5 lifts of 11.55 feet each. The locks at both extremities to be double chambers, 320 by 64 feet in the clear, with the same form of head bays, and the canal to have the same number and size of passing places as contemplated in route No. 1.

Estimate.

Excavation, 484,946 cubic yards dirt, hauled and put into embankment, at 30 cents	$145,484
Walling 95,196 perches inside the cuts and embankments, at $2 50	237,990
Excavation, 21,381 cubic yards clay and alluvium, for lockpits at upper extremity of canal, at 50 cents.	10,690
Double set of locks, three lifts of 11½ feet each, at that extremity	196,854
Bay at head of these locks	25,000
Boom and piers at upper extremity	10,000
Excavation, 18,921 cubic yards rock, for lock-pits at lower extremity of the canal, at $1 50	28,381
Excavation, 21,381 cubic yards clay and alluvium for lock-pits, at 50 cents	10,690
Double set of locks, 5 lifts of 11.5 feet at that extremity	413,615
Bay at the head of these locks	20,000
Three passing places for boats, at $15,000	45,000
Right of soil, 150 acres at $50; clearing and grubbing fifty acres at $40; 200 rods of fence at $1	11,500
	1,155,204
Superintendency and contingencies, 3 per cent.	34,656
	1,189,860

NOTE.—This canal on a high level, it appears, would only cost less by $215,286 than the one on the same route, to be fed from the upper pool of the river.

Navigable feeder.—The approximate location of this is seen on a map of the portion of Indiana on the same sheet E, extending from Columbus, on the east fork of White river, passing in the vicinity of Vernon and Vienna, through Collins's gap; thence descending the valley of Silver creek, to Jeffersonville, where it will unite with the canal it is intended to feed.

The total length of the feeder is about 80 miles. The longitudinal profile of the route is drawn, with its appropriate divisions of 7, 16, 15, 18, and 24 miles, on sheet E.

The locks, 12 in number, and of 13 feet lift each, would be distributed in groups of two in the 24 miles division—making the total lockage, from the summit on Collins's gap into the canal, to be fed, 156 feet.

The cross section of the feeder to be a rectangle from the bottom to the upper surface of the water; above that, the banks to be sloped, and a tow-path to be made on one side only. The sides of the feeder up to the foot of the slope to be lined with vertical walls. The width of the water way to be 40 feet, and the depth of water 5 feet.

Estimate.

Excavation and embankment, equivalent to 18,981,125 cubic yards clay, at 25 cents - - - -	$4,745,281 00
Lining walls of feeder, laid in hydraulic lime, 473,088 perches, at $2 50 - - - - -	1,182,720 00
Masonry for 12 locks, 13 feet lift, (locks single,) 24,000 perches, at $8 - - - - - -	192,000 00
Bridge, culvert, and other masonry, 15,600 perches, at $3 75	58,500 00
Engineering, contingencies, right of soil, &c. - -	100,000 00
	6,278,501 00

This sum added to the sum expressing the cost of the canal to be supplied, and we have $7,476,603 for the probable total cost of the project of a canal upon a high level around the falls, and to be fed from another source than the Ohio.

XIII.—*Comparative costs.*

Eight projects, in all, having been fully discussed on their own independent merits and demerits, upon data of minute surveys, for an improved steamboat navigation at the falls of the Ohio, their relative costs, advantages, and disadvantages, will now be brought into juxtaposition in a tabular form.—(See table B.) Supposing, first, that all the stock (6,151 shares) belonging to individuals of the Louisville and Portland Canal Company, after 1st January, 1844, may be purchased at $140 per share. (This price of $140 per share is a mere supposition I have made for the sake of forming an estimate, and have made it without any authority from the canal company; nor do I know that the stock can be purchased for this price.) Second, that the cost of the stock so purchased, of the improvements required to adapt the existing canal to the wants of commerce, and of the dry dock, (the whole amounting to $1,266,438,) be taken as the unit of comparison.

It should be borne in mind that, in the table of comparison, the dry dock is included, at $50,000, in the cost of the existing canal; whilst in neither of the other projects is a work of this kind estimated for.

From a careful examination of the whole subject, and particularly of table C, it will be seen that the project most likely to come into competition with that of purchasing and improving the existing canal, is the one of constructing a new canal on route No. 1, Indiana side.

If the government had to purchase the whole 10,000 shares of the stock, it could give $105 per share, and improve the existing canal to the whole amount of the estimate, excluding the purchase of the dry dock; and the cost would be the same as to make a new canal on the Indiana side, route No. 1.

The United States already own 2,902 shares absolutely, and conditionally 947 shares, which will have been purchased with the net proceeds of

the canal in 1842 and 1843, instead of making dividends in those years; leaving the 6,151 shares yet to be purchased from individuals.

If the government had to purchase all the shares except what it absolutely owns, considering its own interest in the stock worth nothing, then it could give $147 91 per share for the 7,098 shares, and improve the existing canal to the whole amount required; and the cost would be the same as to make a new canal on the Indiana side.

It will be perceived that the price, ($140 per share,) which I have used merely to form an estimate, is not far from what the stock is probably worth, considering all competition that can be brought to bear upon the interest of the stockholders. I am far from meaning to assert that the stock may be purchased for $140 per share, this price having been assumed merely for the purpose of arriving at a *probable* estimate of the cost of purchasing and improving the canal.

The question as to the "best mode of improving the navigation of the Ohio at the falls" is now to be answered.

If the wants of the commerce of the Ohio are to be answered by *one* canal around the falls, adapted to both an ascending and a descending navigation, for the *present* business, as well as for that of a *few* years to come, I am of the opinion that the best mode will be for the United States either to purchase all the remaining stock of *individuals* (6,151 shares only) and the dry dock, and to make improvements in the existing canal during the years 1844, 1845, and 1846, to the amount of $355,298, and commence as soon as possible, charging tolls only sufficient to maintain the canal in perfect order, provided the State of Kentucky will give the United States exclusive jurisdiction over the whole subject; or, if the stock cannot be purchased at a fair price, then the best plan for the United States would be to construct a new canal on the Indiana side, on route No. 1. The following views may probably furnish some acceptable ideas on the subject.

Under the most favorable circumstances of water, it would take about two years to make all the required improvements in the existing canal, to the amount of the estimate, $355,298; and in the contingency, which ought to be counted, of unusual or extreme high stage of water, the time would be at least three years. During all this time it would certainly be very difficult, although it might not be impossible, to economically execute the improvements without stopping the navigation of the canal; and thus the contingency might occur of being under the necessity of interrupting the present train of business on the river. The number of passages of boats of all classes through the existing canal, has been at the rate of 1,430 per year. To interrupt, for a period of two or three years, the regular trade carried on by so many boats, would very seriously derange the whole system of commercial business, in so far as it relates to navigation, not only upon the Ohio, but throughout the whole Mississippi valley.

This evil would be wholly obviated by constructing a new canal on the Indiana side.

These considerations, together with the greatly increasing commerce of that valley, lead to the question of providing for two canals around the falls of the Ohio—one for a *descending*, and one for an *ascending* navigation. *In the project of two canals*, the proposed passing places in the improvements of the existing canal would, of course, be dispensed with; but the proposed new locks could not be omitted, inasmuch as the existing locks are not large enough for all classes of boats. Also, in the proposed canal on

the Indiana side, (route No. 1,) we should dispense with the three passing places, and make only a single, instead of a double group of locks.

In this view of the question of improving the navigation of the falls, the items to be estimated for, to accomplish the end, would be as follows:

1st. New canal on route No. 1, Indiana side - - -	$1,177,802
2d. Improvements in the existing canal - - -	283,054
3d. Purchase of the existing dry dock - - -	50,000
4th. Purchase of 6,151 shares of stock, yet belonging to individuals, at $140 per share - - - - -	861,140
	2,371,996

The total cost, it will be seen, may be varied from the above, by simply inserting a different price for the stock.

Should this mode of improving that navigation be adopted, the expense of maintaining both canals would be more, by about one-half, than for a single canal adapted to both the ascending and descending navigation; and instead of $25,000, as shown in IV, we should have to provide $37,500 annually, for all the necessary repairs, expenses of custody, &c., for both canals. If this sum be realized from tolls, the charge would be about 18 cents upon each ton of freight, or 12 cents upon each ton of a boat's measured tonnage; but the tolls would diminish in proportion to the increase of business.

After comparing all the projects discussed in this report, their cost, their merits and demerits, for prospective business as well as for present purposes, it is probable that the "best mode of improving the navigation of the Ohio at the falls" will be to purchase all the remaining 6,151 shares of stock belonging to individuals of the existing canal company, and the dry dock, and make improvements in the existing canal, to adapt it to a navigation one way, (to the amount of $283,054;) and at the same time construct a new canal on route No. 1, Indiana side, adapted to a navigation in a contrary way, (at a probable cost of $1,177,802,) and charge tolls only sufficient to maintain the canals, provided the stock aforesaid can be purchased at a fair rate; or, if the said stock cannot be purchased at a reasonable rate, then the best mode will be to construct a new canal on Indiana side, (route No. 1,) adapted to navigation both ways, (at a probable cost of $1,405,146,) and charge tolls only sufficient for the necessary repairs, custody, &c.

In drawing up this opinion, I do not intend to convey the idea that the existing canal company would not be willing to dispose of their stock at a fair price. Nor do I conceive it within the scope of my duty to go any further into the analysis of the value of the stock, than is incidental to those points of the investigation which refer to the comparative costs of the different kinds of improvement.

In conclusion, I take pleasure in expressing my thanks to Allen Campbell, esq., civil engineer, and to H. C. Long, esq., for their able and efficient assistance in our labors in reference to the survey, drawings, estimates, &c., which are embraced in this report.

All of which is most respectfully submitted, by

T. J. CRAM,
Captain United States Corps Top. Engineers.

Colonel J. J. ABERT,
Chief of Corps of Topographical Engineers, Washington.

TABLE B,

Exhibiting comparative costs of eight projects for improving the steamboat navigation at the falls of the Ohio.

Head of the report under which each project is discussed.	Designation of the project for an improved steamboat navigation at the falls of the Ohio.	Cost of each project.	Relative costs—that of the existing canal being the unit of comparison.	Remarks upon the merits and demerits of each project.
Existing canal	Purchasing 6,151 shares of stock, at $140 per share, also the dry dock at $50,000, and improving the canal to the amount of $355,298.	$1,266,438	1.000	This project includes the dry dock, which is not included in any other project. It would not sacrifice the chartered rights of individuals; it would secure as good a navigation as would be required; the works would be as little liable to mud deposites as any other that can be constructed, and less liable than most of the other projects; it would afford an ascending as well as descending navigation at all times when boats could not pass over the falls; it would also cost less than any other project of equal advantages, by $88,708.
Bed of the falls	*First method.*—Only a descending navigation; pilots' method (with supplement) A B, drawing No. 13.	526,695	0.416	This project would only secure a descending navigation, and that but a very indifferent one, requiring a continuance of the system of pilotage. It would be equivalent to appropriating half a million to the advantage of the falls pilots, and taking a large portion of the profits of the present canal company, without any advantage to commerce. There would be an increased expense yearly, to keep up this project; and if constructed, in all probability, would be abandoned in a few years.
	Second method.—Canal C D, (drawing No. 13,) extending from head of "Middle chute" to foot of "Kentucky chute," with locks, &c.	1,351,777	1.067	At first view, it would seem that this is a good project. Its cost is more, by $135,339, than that of the existing canal; it would sacrifice the chartered rights of the existing canal company; it would be liable, at every rise, to immense deposites at the lower locks, and also to be choked with drift wood; its cost, for repairs and custody, would be very great; it would have a very difficult entrance at the upper extremity, and be difficult of access from the shore. All these objections could not be obviated, without adding to its cost $250,000, which would make its total cost $1,601,777—greater than the existing canal project, by $385,339.
	Third method.—Canal E F, near Indiana side, (drawing No. 15,) to head of Big eddy, with locks, and sluice S, through "Goose island."	1,006,233	0.795	This would be submerged at all times, except at extreme low water; there would be times when the gates could not be opened, when the work would be required for the passage of boats; great inconvenience from drift wood; works very difficult of access from the shore; much detention of boats at upper extremity of sluice; upper end of the canal difficult to enter; it never could be made as good for the navigation as the existing canal; its cost of repairs and custody would be far greater.

	Fourth method.—Dam G H, (drawing No. 15,) locks, and sluice S.	664,767	0.524	Objectionable in every point of view, except in cost. It would, in all probability, seriously injure, if not destroy, the present harbor of Louisville; its cost of repairs and custody would be much more than the existing canal project, and there would be times when it would operate as a positive obstruction to the good natural navigation over the falls.
Canal on Indiana side.	*Route No.* 1.—New canal on Indiana side, from Jeffersonville to just below the Point of Rocks, (plat D,) to be fed from the upper pool of the Ohio.	1,405,146	1.109	This is a good project, so far as the interests of commerce are concerned; but the canal would be one mile longer, and no better than the existing one on the Kentucky side. It would be more liable to deposites at the locks; it would cost more, by $188,708, than the project for purchasing and improving the existing canal. Besides this, a destruction of the chartered rights of individuals, to the amount of 6,151 shares of stock, valued at $861,140. A new canal, it is true, would increase the value of private property on the Indiana side, perhaps to an equal amount; but the general interest would be no better off than by the project of the existing canal.
	Route No. 2.—New canal on Indiana side, from Jeffersonville to the mouth of "Falling run," (plat D,) to be fed from upper pool.	2,973,642	2.348	The only advantages of this route are, a better ingress and egress at the locks, and an avoidance of the "Albany bar" and the rocky place No. 7, plat A. But these advantages are far more than counterbalanced by the disadvantages; and when we take into account the very great expense of constructions and subsequent cost of repairs and custody, and time of passing through it, the mind rejects the project.
	Canal on a high level on route No. 1.—To be fed by a navigable feeder from Columbus, Indiana, to Jeffersonville, 80 miles long, (plat E.)	7,476,603	5.904	This would be more for the advantage of the interior of Indiana than for the general commerce; and it is not to be supposed that the United States will undertake it. The development, however, of the project, may be of use to the State of Indiana, in exhibiting the cost of what would be an advantageous work for the State.

SUPPLEMENTARY REMARKS BY THE SUPERINTENDENT OF THE LOUISVILLE AND PORTLAND CANAL, SHOWING—

1st. Profits of the United States by her investment in the canal.
2d. Tolls and business of the canal, and its comparative advantages to the stockholders and the commerce of the Ohio.
3d. Present plan of the company for liquidating their stock, and making the canal free.
4th. This plan of the company is no relief from taxation on commerce.
5th. Best mode of making the canal free, and improving it.
6th. Views of those engaged in commerce on this important subject.
7th. Views of the individual stockholders, and their disposition to sell.

1st.—Profits of the United States by her investment in the canal.

To ascertain the pecuniary loss or gain of the United States, by Congress investing $233,500 of the public money in the bold undertaking of constructing the Louisville and Portland canal, estimate (what is probably near the truth) that the United States was then paying about 5 per cent. interest on its loans, and make an account current between the United States and the canal.

The United States in account with the Louisville and Portland canal.

THE UNITED STATES, CR.

By cash paid for 1,000 shares of stock, originally subscribed -	$100,000 00
By cash paid for 5 per cent. interest on same, from the time it was paid to September 1, 1843 - - - -	80,000 00
By cash paid for 1,335 shares, (forfeited by individuals) -	133,500 00
By cash paid for 5 per cent. interest on same, from the time it was paid to September 1, 1843 - - - -	95,719 00
Total -	$409,219 00

THE UNITED STATES, DR.

To total amount of semi-annual dividends actually paid into the treasury of the United States - - - -	$257,778 00
To total amount of interest, at 5 per cent., on these semi-annual dividends, from the times at which they were paid down to September 1, 1843 - - - -	67,921 00
To 2,902 shares of stock, prior to 1842, estimated to be worth, then, $140 per share - - - - -	406,280 00
Total -	$731,979 00

Taking the difference of these two totals, there will be found the sum of $322,760 standing as a net gain in favor of the United States. Thus, after allowing the United States 5 per cent. per annum interest on the money

Congress invested in this improvement, the United States has had returned to its treasury all the investment, and 5 per cent. annual interest on that investment, and, in addition thereto, the product in stock and cash of $322,760. In deducing this result, it will be observed, the stock held by the United States is estimated to be worth $140 per share—being only $40 in advance of its par value, or above its original price.

To elucidate as fully as possible the value of this stock, the annual per centum the United States has received on it from the time of the investment down to the 1st September, 1843, (a period of 15⅙ years,) the stock will be found to have yielded for this period 8.88 per cent. annually. By dividing the whole period into three partial periods of from 4 to 5 years each, and calculating the per cent. annually for each of these parts, an idea of the progressive increase and value of the stock will be seen.

The result will be—that, from the time the United States made the investment to January 1st, 1834, the stock yielded a return to the United States treasury of 5½ per cent. annually; from January 1, 1834, to January 1, 1839, it yielded a return to the United States treasury of 9.18 per cent. annually; and from January 1, 1839, to January 1, 1843, it yielded to the United States 10.7 per cent. annually.

For the years 1841 and 1842 the yield was only about 8.27 per cent. annually, owing to continued high water, and, consequently, the less passing through the canal; and also to an actual falling off of trade during these years.

From these per centums, the value of the stock may be inferred. Should the present policy in relation to this canal be continued, without any action of Congress affecting its value, the stock will continue to yield a net income of from 10 to 18 per cent. annually.

At the time of commencing this work, the public generally, and particularly those professing themselves peculiarly endowed with the foresight of perceiving limits to the future magnitude and wants of the trade upon the Ohio, predicted that the time would never come when a steamboat so large as the dimensions of the locks would be constructed to navigate this river. The scale of the Louisville and Portland canal was pronounced unnecessarily large and extravagant; it is with ill grace, therefore, that the company is now reproached with the oversight of having made the locks smaller than the present wants of steamboat navigation demand.

2d.—Tolls and business of the Louisville and Portland canal, and its comparative advantages to the stockholders and the commerce of the Ohio.

The charter from the legislature of Kentucky directs, "That the president and directors shall keep a true account of the cost and expenditures and receipts of said canal; and, on the first Monday in January in each year, have the same made up, and the balance of profit divided among the stockholders, and report the same to the General Assembly of the commonwealth of Kentucky; and should it appear, by the said returns, that the net profits exceed 18 per cent. per year, after the expenses, repairs, and necessary improvements are made, the legislature reserve to themselves the right so to reduce the amount of toll, that the profits to be divided shall not exceed 18 per cent. per annum." The charter is perpetual.

Under these regulations, the canal has been in operation about 13 years; and, of course, for the same period the commerce of the Ohio has been more or less intimately influenced thereby.

During the 12 years ending December 31, 1842, there were 12,550 passages of steamboats, and 4,613 passages of flat and keel boats: in all, 17,163 passages through the canal—equal to 2,193,203 tons per government measurement.

The total amount of tolls charged by the company upon those passages through the canal, for the same period, was $1,120,350 25; which, divided by the total number of passages, gives $65 27 for the average toll upon each passage of every boat that passed through the canal for that period.

In an agricultural and commercial point of view, this toll (presuming that boats carry three-fourths of their measured tonnage) is equivalent to a tax, in shape of toll, of 68 cents per ton, or $3\frac{4}{10}$ cents per 100 lbs., and may be regarded in the light of consideration which the producer and consumer have paid during the period the canal has been in operation—not upon compulsion, but at their own option, either to avail themselves of such conveniences as the canal has afforded, or the natural facilities afforded by the water on the falls; the facilities for passing up and down the falls remaining the same as if no canal had been constructed. The simple statement of these facts is sufficient to do away with the idea that many have entertained, of the tolls of the canal being regarded in the light of a tax upon commerce, without a mutual benefit, or considered as a monopoly.

Considered in an abstract point of view, the tolls upon the Louisville and Portland canal (which is a little less than two miles in extent) do certainly seem enormous and unreasonable. This question, however, should be decided by comparison, rather than by an abstraction. To ascertain, therefore, whether these tolls be high or low, it is necessary to compare them with tolls charged on other works, taking into comparison the relative original cost of each.

The following table, constructed with care, and from official documents pertaining to the several works, will exhibit the comparison:

Comparison of tolls on works of internal improvement in the United States.

Name of the work.	Original cost of the whole of each work.	Number of cents toll charged for 100 lbs. freight passing through the whole work.	Number of cents toll charged for 100 lbs. on a million of dollars invested in each work.
Louisville and Portland canal -	$1,009,277	$3\frac{4}{10}$ cents.	$3\frac{3}{10}$ cents.
Muskingum improvement - -	1,582,459	$8\frac{2}{10}$ "	$5\frac{1}{10}$ "
Ohio canal - - -	4,695,203	$34\frac{7}{10}$ "	$7\frac{4}{10}$ "
Kentucky river improvement -	887,000	$3\frac{}{8}$ "	$3\frac{5}{10}$ "
Wabash and Erie canal - -	2,834,373	$8\frac{2}{10}$ "	$2\frac{8}{10}$ "

Capitalists and others invest their money in works of public utility, in consideration of being allowed to collect a per centage on their capital from the public, in the shape of toll. Upon this view of the case, it is shown in the last column of the foregoing table, that the toll upon a given amount of capital, allowed to be collected by the Louisville and Portland canal, falls below the tolls of three, and above the tolls of one of the four works with which it is compared.

In estimating the benefits of this work to the commerce of the west, the cost to the producer and consumer, by a land carriage and system of transhipment round the falls, in addition to the cost of cartage, the risk, detention, waste, and damage that would naturally accrue by the unloading and re-loading of boats above and below the falls, would greatly exceed the cost of passing through the canal. Nor should it be forgotten that the charges consequent upon two sets of boats—one for the upper, and one for the lower Ohio—would add much to the cost of transportation.

It is well to remark, also, that, previous to the opening of this canal, the produce of the upper Ohio reached the lower markets on the Mississippi all at once, (so to speak,) being obliged to go down at times of high water at the falls; the consequence was, that the New Orleans market was glutted, and low prices ensued. These fluctuations have, in a great measure, ceased since the canal went into operation.

The apparent high profit realized by the company is the result of some twenty years investment and judicious management on their own part of a capital of one million of dollars, and is based upon the presumption of the stock being worth one hundred and forty dollars per share; at the same time, from an accurate estimate made from official documents, it is ascertained that the public has realized a real profit (not prospective) of about two millions of dollars; which amount is the difference that it would have cost to the producer and consumer to have transported around the falls the absolute amount of tonnage passed through the canal over and above what has been paid to the company.

These results afford a striking illustration of the public benefit that may reasonably be expected to flow from an act of Congress appropriating money in aid of internal improvements, whenever the contemplated work can be shown to be of national importance. But it is not intended, by deducing the fact of so great a saving to the community by the facilities which the canal affords, to offer an argument against the expediency of measures tending to augment that saving to the utmost degree, consistent with chartered rights and other interests involved in the question of improving the navigation at the falls of the Ohio. True policy unquestionably dictates that the navigation there should be made free, in a manner to do justice to all parties.

The stockholders of the Louisville and Portland canal have taken steps to render the canal free, by its own future operations.

As the plans for effecting this purpose are of great importance to the subject, it is deemed essential to give them somewhat in detail, though with as much brevity as possible.

3d.—*Present plan of the Louisville and Portland Canal Company for liquidating the stock, and making the canal free.*

In January, 1842, the Louisville and Portland Canal Company petitioned

the General Assembly of Kentucky for an amendment of their charter, upon apprehensions which are presented in their own language: "In the repeated applications to Congress for another canal, the hostility exhibited to the company from various quarters, and the apathy with which propositions to destroy its rights are entertained in Congress and elsewhere, together with the general expectation that the thoroughfare for the navigation of this important section of the Union should be free;—under these circumstances, it has been deemed prudent by many who are largely interested, that, although (if fully assured of the safety and stability of all the rights and immunities granted them by the charter) the stock would be a good investment at $250 per share; yet, from the indications of government and individual interference, they would be content to receive a sum much below the intrinsic value of their stock."

Accordingly, on the 21st February, 1842, the legislature of Kentucky amended the charter by an act, of which the following is an abstract:

Sec. 1st provides—"That whenever the stockholders in said company shall direct, the board of president and directors of said company shall have the privilege of selling the shares of stock owned by individuals in said canal, to the United States, or the State of Kentucky, or the city of Louisville, for the purpose of eventually making the said canal free of tolls; or, further to effect this object, the board of president and directors, when so authorized as aforesaid, shall hereby have the privilege of appropriating the net income arising from said canal to the purchase of said stock, instead of making dividends therewith."

Sec. 2d provides—"That whenever said stockholders shall authorize said board of president and directors to appropriate the annual net income of said company to the purchase of shares held by individuals in the same, it shall be the duty of said board to advise each stockholder of the amount appropriated to the purchase of shares, and propose to purchase the number of shares that the sum on hand will warrant, at the least bid; and thirty days' notice shall be given of such offers of stock to be made."

Sec. 3d provides—"That the maximum price at which the said board shall purchase said shares, for the first year, shall not exceed the sum of one hundred and fifty dollars per share; and when the offers of said shares are made, it shall be the duty of said board to accept the lowest offer for the number of shares which the net income of the preceding year will allow them to purchase; and no dividends will be paid on the remaining shares of said company, after the ratification of this amendment; the maximum price paid for the shares purchased the first year, and six per centum per annum annually added thereto, shall be the highest price which shall be paid for the shares in each subsequent year."

Sec. 4th provides—"That the shares so purchased by said board shall be held in trust by it, for the purposes herein declared, and shall be voted on by them at all subsequent meetings and elections, until, by the operation of the provisions of this act, all the shares standing in the name of others than the government of the United States shall have been purchased up; and when the said shares shall be all purchased, the same shall be transferred to the government of the United States, on condition of said government levying tolls for the use of said canal, only sufficient to keep the same in repair, and pay all necessary superintendence, custody, and expenses, and make all necessary improvements, so as fully to answer the purposes of its establishment, and further to protect and guard the interests

of commerce. The superintendent, or agent, in charge of said canal, shall ever hereafter, on the first Monday in January, annually, report to the General Assembly of Kentucky the amount of tolls levied and received, and of the charges and expenses incurred on the same; the General Assembly reserving the right of directing the amount annually to be collected, if found too much for the purposes contemplated by this amended act."

Sec. 5th provides—"That it shall be the duty of the said board of president and directors to report to the General Assembly on the first Monday in January, in each year, the condition of the canal, and state the number of shares purchased, and the amount paid for the same: provided that nothing contained in this act shall give said company the right to increase the toll allowed by the original charter."

The 4th section of the above amendment to the charter of the Louisville and Portland Canal Company being objectionable, the following act was passed, to obviate any difficulty between the State of Kentucky and the general government on the score of jurisdiction:

"*Be it enacted by the General Assembly of the Commonwealth of Kentucky*, That, in the event of the United States becoming the sole owner of the Louisville and Portland canal, the jurisdiction of this commonwealth over said canal shall be yielded up to the government of the United States; and no annual report, as mentioned in the charter of the Louisville and Portland Canal Company, shall be required to be made by the United States, or their agents and superintendents, of said canal, to the General Assembly of this commonwealth." (Approved February 22, 1844.)

At a meeting of the stockholders, on the 4th of July, 1842, it was resolved, by a legal majority of votes, that the board of president and directors of the Louisville and Portland Canal Company should accept and ratify the foregoing act, with the provision that the same board shall so arrange and establish the method of purchasing the shares of individual stockholders as to enable each one, so desiring it, to sell a portion of his or her shares—about equal to the proportion that his or her shares bear to the amount that will, in each year, be appropriated under this amended act to the purchase of shares, varying only so far in this rule as to stockholders who are the owners of five or less shares, which may be all taken if offered.

By this amendment, all the private stockholders have agreed to sell their stock at prices not to exceed specified rates—to wit:

In the year 1843,	at prices not to exceed		$150	per share.
In the year 1844,	"	"	159	"
In the year 1845,	"	"	168	"
In the year 1846,	"	"	177	"
&c.,	&c.,		&c.	

Since the ratification and acceptance of the amendment of the charter by the unanimous vote of the stockholders, the operations of the company have been conducted with reference to the object of making the canal free.

In accordance therewith, the company purchased with the net income of 1842	-	471 shares.
With the net income of 1843	-	544 "
And with the estimated income of 1844, (say)	-	883 "
		1,898 "

To which add the number of shares previously owned by the United States - - - - - -	2,902 shares.
It results that the United States will own on January 1, 1845	4,800 "
Leaving still in the hands of individual stockholders -	5,200 "
Whole capital being - - - -	10,000 "

This plan of the company for gradually purchasing up their own stock with the net income of the canal, is certainly very creditable and liberal, when it is considered that many of these stockholders paid $150 per share for the stock they hold, and have been receiving an average of $10\frac{7}{10}$ per cent. on $100 annual dividends for the four years preceding the arrangement entered into for liquidating the stock. They certainly have yielded the difference between $10\frac{7}{10}$ per cent. and 9 per cent.—the latter being the interest at 6 per cent. on $150—to say nothing of their further yielding all future increase of dividends, which would certainly accrue, and in a very few years arrive at the limit of 18 per cent., allowed by their charter. But, it will be asked, why do they make any sacrifice? The answer is, they fear the permanency of their investment, not from any deficiency or injury that the canal itself may be subject to, but for the reasons set forth in their petition to the legislature of Kentucky; and the further conviction that it is not to be expected that the people of the west will much longer quietly submit to a heavy tax being levied on the commerce of the Ohio, by private individuals, and the United States their partner, who have become possessed of a lock and key to the great national highway of the valley of the Ohio. Hence the stockholders judiciously conclude, from the risk and uncertainty that an incorporated company stands against the constant appeals of the people for legislative relief, that it is best to adopt the plan of liquidating their stock.

Inasmuch as no dividend or interest is paid to the stockholders, in lieu thereof they are entitled each to sell to the company (purchased by net income) a *portion* of their stock the first year, January 1, 1843, at $150 per share; and 6 per cent., or $9 per share, is annually added to the price: it simply results in being equivalent to a sale on the part of each stockholder of the *whole* of his stock on the 1st of January, 1843, at $150 per share, and investing the proceeds at 6 per cent. interest, for the time it will require for him to realize principal and interest in annual instalments, as by the plan adopted.

From the above fact, it appears that the individual stockholders all considered their shares as worth $150 each, in the year 1842, (a year of great depression in the stock market;) and if we add 6 per cent. to this price, for the two years up to 1844, on that portion not sold and drawing no dividend, the stock should sell for $168 per share in 1845, to fully reimburse those who paid $150 per share when they bought originally.

4th.—This plan of the company is no relief from taxation on commerce.

To fully carry out this plan of the company, it will require from ten to fifteen years, varying as the net income may be more or less; hence, after all, the commerce of the Ohio has to purchase the canal by paying for it in tolls for ten or fifteen years. It is true that at the end of this period the canal will belong to the United States, it being the only stockholder left;

and the United States will not be indebted to the company for the entire ownership of a national work, but will have, in reality, acquired it by taxing and collecting from the commerce of the Ohio and the people of the west a sum sufficient to realize the possession of a work that is of indirect consequence to the whole Union, and of which the whole Union will become the owner. Therefore it is not just that a PORTION of the community should have the burden of paying for a national work that will belong to the WHOLE community.

5th.—Best mode of making the canal free, and of improving it.

True policy and justice to all parties point out the great necessity of Congress making a direct appropriation of (say) $500,000 or $600,000, to be invested in the purchase of Louisville and Portland Canal stock by the Secretary of the Treasury, at not exceeding —— per share.

An appropriation of this amount on the part of Congress, together with the income of the canal for the year 1845, would be amply sufficient to give the United States sole possession of this important work, at a less cost by one-third of what any other improvement would incur; and with a moderate toll (say) of 20 cents per ton for three years, the improvements suggested in the accompanying report of Captain Cram could be effected without cost to the general government; and, moreover, by a *gradual* outlay for improvements, the work could be done without interrupting the navigation of the canal, except during extreme low water in the fall season, when little or no commerce exists.

6th.—Views of those engaged in commerce on this important subject.

From the great opportunity the author of this communication has for acquiring a knowledge of the feelings and sentiments of those actively engaged in commerce on the Ohio, he will be warranted in saying that they will readily pay 20 cents, or more, per ton, in toll, to sustain the work and make the requisite enlargement and improvements; and when these are completed, a toll of 10 cents per ton, (if so much is required,) to keep the work in good order, and pay all expenses of attendance.

A prospect of a speedy reduction of the present rate of toll (50 cents per ton) to 10 cents, and an improved canal navigation, would give more lasting relief and joy to the thousands directly and indirectly interested in the national highway of the vast valley of the west, than could be given for a like sum appropriated by Congress for any other object.

In conclusion, the subscriber, from his long connexion with the Louisville and Portland canal, and the stockholders thereof, will state that the latter will place no obstacle in the way of the United States becoming sole owner, by purchase, at the same time, that they will leave it in the hands of Congress to offer any price per share that the facts already shown may dictate. They (the stockholders) will accept any just and fair offer. A given price that would be acceptable to all the shareholders is difficult to arrive at; nor would it be proper in the undersigned to name any price, without authority from all concerned; he can only reiterate his candid opinion, that the stockholders desire only such a price as may be just and equitable, and will be satisfied to receive indemnity for the intrinsic worth of their property.

JOHN HULME,
Superintendent of the Louisville and Portland Canal.

LOUISVILLE, *December*, 1844.

OFFICE OF LOUISVILLE AND PORTLAND CANAL CO.,
January 8, 1845.

SIR: In reply to your communication of the 2d inst., enclosing "a resolution of the House of Representatives, requesting you to communicate to the House your opinion as to the propriety of the purchase by the United States, of the residue of the stock held by individual stockholders in the Louisville and Portland Canal Company, with a view to making the navigation of said canal free from toll; and also the terms, in your opinion, on which the purchase can be made, and the probable amount of money which will be required to effect the same;" I have the honor to furnish you with the last annual report of the company, and also a report made by the War Department to the Senate at their last session, with supplementary remarks by Mr. Hulme, superintendent of the canal, and a map of the falls, made from a most accurate survey.

		Shares.
The whole stock of the company is held in - - -		10,000
Of which the United States are original owners of -	2,902	
In 1842, the net income was applied to the purchase of the stock of individual stockholders, and no dividends were made, and there were purchased - - -	471	
In 1843, there were purchased in like manner - -	544	
In 1844, by the same process, there were purchased -	771	
The net income of 1845 is estimated to purchase - -	812	
		5,500
Thus there will be standing in the name of individuals at the close of the present year - - - - -		4,500

If a law should be passed by Congress to purchase the shares of individual stockholders, it is fair to conclude that its objects would not be completed before the end of the year, and that the income of the year could continue to be appropriated to the attainment of the same object. The board of president and directors have no means of controlling the shares belonging to 73 stockholders residing in nine States; but, from the best information they are enabled to obtain, it is their opinion that the shares can be purchased by the United States for $140 each, although they are worth $150; but, in consideration of the object of making the canal free from tolls, they will generally be induced to sell to the United States at the first named price: therefore, 4,500 shares, at $140, will amount to the sum of $630,000.

If an act of Congress should be passed of the following tenor, the object would doubtless be attained: "That the Secretary of the Treasury is hereby authorized to purchase the stock of the Louisville and Portland Canal Company held by individual citizens or corporate companies, at a sum not exceeding $140 per share; and the sum of $630,000 is hereby appropriated," &c.

It requires no argument with you to show the importance to the trade of the twelve States and Territories which receive their supplies and send their produce to market through this channel, burdened with a tax in the shape of tolls to this canal, amounting in the aggregate to more than $150,000 per annum.

You are well aware that it is the general desire and expectation of all

persons who have any interest, direct or indirect, in the navigation of the western rivers, that this canal shall become the property of the United States, and that the trade of the country must be relieved of this onerous and burdensome tax—a tax which is peculiar to the west, and partial in its operation. The United States have expended on breakwaters, harbors, and light-houses, large sums of money in various sections of the Union; yet no toll or tax is demanded from those who derive direct benefit from them, while no one of those works is of more importance, or more national in its character, than this canal, through which upwards of 300,000 tons of shipping annually pass; and yet the commerce of the west pays an annual tax, indirectly, into the national treasury, by exaction of tolls on this important link of communication in the centre of the cultivated part of the Union.

Your personal knowledge of all that pertains to this subject renders any extended remarks unnecessary. Knowing that you will return such a reply as the resolution requires, I submit the same in safe hands.

Most respectfully, your obedient servant, &c.,

JAMES MARSHALL, *President.*

SIMEON S. GOODWIN, *Secretary.*

Hon. GEO. M. BIBB,
Secretary of the Treasury.